India—The Land and the People

GARDEN FLOWERS

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India—The Land and the People

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DR. VISHNU SWARUP

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PREFACE

In this book an endeavour has been made to describe the various kinds of flowers commonly grown in gardens in India. The aim is to acquaint the flower growers, particularly the amateur gardeners, with the different kinds of garden flowers, their uses in gardens and their methods of cultivation. The popular as well as Latin names of each flower, the botanical family to which it belongs and the place of its origin have also been mentioned. A few chapters in the beginning deal with the aesthetic and economic importance of flowers, the various kinds of flowers grown in gardens, a short history of flowers and of gardening in India and the important flowers that are natives of our country. A brief account of the various cultural practices adopted for growing the herbaceous or non-woody plants as well as of the important diseases and insect pests attacking them and the measures to control them is also presented.

Of the six kinds of flowers commonly seen in the gardens, such as trees, shrubs, climbers, herbaceous annuals, biennials and perennials, bulbous flowers and water plants, the former three have not been described in this book, as some very good books on them are already available. These include *Beautiful Trees and Gardens* (I.C.A.R., New Delhi) and *Flowering Trees* (National Book Trust, New Delhi) by Dr. M.S. Randhawa, *Some Beautiful Indian Climbers and Shrubs* by N.L. Bor and M.B. Raizada (Bombay Natural History Society), *The Beautiful Climbers of India* and *The Rose in India* (I.C.A.R., New Delhi) by Dr. B.P.Pal and *The Bougainvillea* by Dr. B.P. Pal and Vishnu Swarup. Another book on shrubs by Dr.B.P. Pal and Dr.S.Krishnamurty has been brought out by the Indian Council of Agricultural Research. However, a few very popular shrubs, such as bougainvillea, jasmines, azalea, camellia, geranium and fuchsia have been described in this book. Azalea, camellia, geranium and fuchsia are commonly found in gardens in the hills, while bougainvillea and jasmines are well known in the plains. The jasmines are natives of our country.

I wish to express my gratitude to Dr. M.S. Swaminathan, the former Director-General, Indian Council of Agricultural Research, and Dr. B.P. Pal, under whose advice and guidance I ventured to undertake this assignment. I am grateful to Dr. S.K. Mukherjee and Dr. A.B. Joshi, for their valuable help and encouragement in the preparation of this book. My thanks are also due to Shri R. Rajendran for his keen interest and patience in taking photographs for this book.

Vishnu Swarup

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CHAPTER I

Introduction

FLOWERS ARE SYMBOLIC OF BEAUTY‘ LOVE AND tranquillity. They form the soul of a garden and convey the message of Nature to man. In our country, flowers are sanctified and are commonly used in worship in homes and temples. We are intimately associated with flowers and on all festive occasions and in marriages and religious ceremonies and social functions, the use of flowers and garlands has become almost essential. Flowers also adorn the hair of women, particularly in South India.

Besides their aesthetic value, flowers are also important for their economic uses, such as, for cut blooms and for extraction of perfumes and other products. An earlier survey made by the Indian Council of Agricultural Research has revealed that about 10,500 tons of cut flowers worth Rs.9.26 crores are sold annually in the markets of metropolitan cities like Bombay, Calcutta, Madras, Bangalore and Delhi. It is estimated that about 4,000 hectares (10,000 acres) are under cultivation as flowers for commercial purposes. However, in recent years both area and production of flowers have increased substantially but precise estimates are not available. Marigold, jasmine, rose, crossandra and small-flowered chrysanthemum are commonly used for cut flowers, particularly in South India. The trade in perfumes has already been established and some flowers like the rose and jasmine are commonly used for extraction of perfume. The perfume industry flourished during the Mughal days. In India the fragrance of flowers is much prized and there are many connoisseurs of perfumes. Besides, the seed and nursery business is also important and it is a source of livelihood to many. It may be mentioned that there is also export of ornamental plants, seeds and bulbs every year. From a small town like Kalimpong (West Bengal) which is an important centre for ornamental plants, it is reported that flower seeds, particularly of the wild flowers of the Himalayas, bulbs, orchids, ferns, etc., worth about Rs.400,000 are exported to foreign countries annually. In recent years, flori-cultural products (seeds, bulbs, plants and cut flowers) have been exported from India. The total value of exports of floricultural material though not very significant in the export market was 24.28 lakhs in 1976-77, Rs.75.50 lakhs in 1977-78, Rs.80.85 lakhs in 1978-79 and Rs.56.22 lakhs in 1979-80. These exports included about 38% cut flowers, 37% foliage plants, 11% flowering plants and 14% others.

In the garden generally the flowering plants are of two main types, namely, herbaceous and semi-woody or woody. The herbaceous flowers are annuals, biennials or perennials, while the semi-woody and woody are usually perennials. An annual plant grows from fresh seeds sown each season, flowers, sets seeds and dies within a year. The biennial plant completes its life cycle in about two seasons or years. The perennials when once sown or planted continue to live and flower in successive seasons for a number of years. Most of the flowers of the winter or rainy season are herbaceous annuals, such as antirrhinum, aster, balsam, petunia, phlox, dianthus, sweet pea, calendula, verbena, marigold, zinnia, etc., while a few like Campanula (Bellflower), Sweet William and some others are herbaceous biennials. Among the herbaceous perennials, Delphinium, Lupins, Gaillardia, Michaelmus Daisy, Shasta Daisy, etc., are popular. Rose, chrysanthemum, bougainvillaea, azaelea, geranium, fuchsia, camellia, jasmines, etc., are woody or semi-woody perennials. Flowering trees and shrubs are important woody perennials grown in the garden. Besides, some plants form bulbs, tubers or corms from which they are generally propagated. They are popularly known as bulbous flowers and include such flowers as amaryllis, dahlia, gladiolus, narcissus, daffodil, tulip, etc.

There are also some aquatic plants grown for their attractive flowers, such as the lotus (*Nelumbo nucifera*) and the water-lily (*Nymphaea sp.*).

CHAPTER II

History of Flowers and Gardening in India

AMONG THE SEVERAL KINDS OF FLOWERS GROWN IN THE garden, only a few are natives of our country. The important flowers which are natives of India and which are under cultivation in different parts of the world are orchids, rhododendrons, musk rose *(Rosa moschata)*, begonia, balsam *(Impatiens balsamina)*, globe amaranth *(Gomphrena globosa)*, gloriosa lily *(Gloriosa superba)*, foxtail lily *(Eremurus himalaicus)*, primula *(Primula denticulata P. rosea)*, blue poppy *(Meconopsis)*, lotus *(Nelumbo nucifera)*, water lily *(Nymphaea* spp.), clematis *(Clematis montana*—a climber) and the wild tulip of the Himalayas *(Tulipa stellata* and *T. aitchisonii)*. Of these, only the lotus has been mentioned in the ancient Sanskrit scriptures of Vedic times. Mention of the lotus was also made by Kalidasa in his play *Shakuntala.* The poet Asvaghosa (A.D. 100) also mentions the lotus in his *Buddha Charita.* According to Dr. M.S. Randhawa, the flowering trees were commonly grown in the gardens in the Hindu-Buddhist periods and the native annual herbaceous plants were perhaps not cultivated.

Gardening has been popular in India from ancient times. In the *Ramayana,* mention is made of the Ashokavana, in which Sita was held captive. 'Ashoka' trees *(Saraca indica)* were predominant in this garden. A description of the layout of gardens and parks and artificial lakes in the city of Indraprastha is given in the *Sabha-Parva* of the *Mahabharata.* Several trees, such as *Saraca indica, Terminalia arjuna, Mesua ferrea,* *Ficus benghalensis, F. religiosa, Michelia champaka, Butea monosperma* and *Cassia fistula,* have been mentioned in the *Ramayana.* Almost all of them have also been described in the *Mahabharata.* The association of Lord Krishna with the Kadamba tree *(Anthocephalus indicus)* is well known. In the ancient Sanskrit work of Panini in Ashtadhyayi, several beautiful trees are mentioned, such as *Ficus (F. religiosa, F. benghalensis, F. infectoria), Butea monosperma, Prosopis spicigera, Kadamba* and a few others. The poet Asvaghosa described the Nandanavana in which Siddhartha saw flowering trees and lotuses. During the Buddhist period, gardens were laid out around the monasteries and *stupas* and there were beautiful gardens in Nalanda and Taxila. It is said that Lord Buddha was born under a tree in a garden, the *pipal.* The Bodhi tree, under which the Buddha attained *nirvana,* is sacred to the Buddhists. The planting of roadside avenue trees (*margeshuvriksha)* was an important contribution of the king Ashoka (233 B.C.). Similarly, Shudraka (100 B.C.) has also given an account of gardens and flowers in the *Mrichhakatikam.* Kalidasa (about 57 B.C.) in his play *Shakuntala* has mentioned the pleasure-garden having a bower of the *madhavi* creeper *(Hiptage madablota)* and several beautiful trees like *Ashoka (Saraca indica), Kadamba (Anthocephalus indicus), Arjuna (Terminalia arjuna), Vakula (Mimusops elengi), Palasha (Butea monosperma), Parijata (Nyctanthes arbor-tristis)* and *Kavidara (Bauhinia variegata).* The art of gardening has been described by Sarangadhara (A.D. 1300) in his *Upavana Vinoda,* and *Sarangadhara Paddhati,* wherein mention is also made of some trees. Vatsyayana (A.D. 300-400) has also rendered interesting accounts of four kinds of gardens, namely, *pramadodyan, udyan, vrikshavatika* and *nandanvana.* Classical Sanskrit literature, as mentioned above, as well as the flower and tree motifs delineated in old sculptures and the architecture of Mathura (Kanishka period A.D. 78-101), Bharhut, Sanchi and several others and displayed in the Ajanta frescoes (A.D. 100 to 600) bear testimony to the importance of gardening and flowers in Indian culture.

The important native ornamental flowering trees, many of which have been mentioned in ancient literature, are *Kachnar (Bauhinia variegata), Amaltas (Cassia fistula),* Pink Cassia *Cassia nodosa), Dhak* or Flame of the Forest *(Butea Frondosa)* Indian coral tree *(Erythrina indica), Erythrina blakei,* Pride of India *(Lagerstroemia flos-reginae, L. thorelli), Lal Lasora* or Scarlet Cordia *(Cordia sebestena),* yellow silk cotton *(Cochlospermum gossypium), Karanj (Pongamia glabra), rugtrora* or Wavy-leafed Tecomella *(Tecomella undulata),* tulip tree or Wavy-leafed Tecomella *(Tecomella undulata),* tulip tree or *Bhendi (Thespesia populnea), Crataeva roxburghii, Sterculia colorata, chalta (Dillenia indica), Ashoka, Kadamba* and rhododendrons.

Among the native shrubs and climbers, the most important ones are the jasmine *(Jasminum sambac, J. pubescens, J. auriculatum, J. humile, J. officinale, J. grandiflora*) and *madhavi (Hiptage madablota),* which have been mentioned by Kalidasa in his plays. The other indigenous species are *Bauhinia acuminata, Mussaenda frondosa, Ixora spp. (I. coccinea, I. parviflora, I. barbata, I. undulata), Hamiltonia suaveolens, Holmskioldia sanguinea, Clerodendron inerme, Crossandra infundibuliformis, Plumbago rosea, Plumbago zeylanica, Tabernaemontana coronaria, Trachelospermum fragrans, Osmanthus fragrans, Passiflora leschenaultii, Clitoria ternatea, Porana paniculata, Gloriosa superba* and *Clematis montana.*

Like many crop plants, several of the flowers, particularly the herbaceous annuals, biennials and perennials and bulbous flowers grown in gardens in our country, have been introduced from abroad. These exotic flowers have come from Europe, America, Africa, China, Japan and other countries. The place of origin of the different flowers is mentioned in the description of the species separately. How these exotic flowers were introduced in India has not been properly recorded. However, it can be said that most of the exotic flowers were introduced during the Mughal and British periods. With the renaissance of gardening in India by the Mughal emperors beginning with Babur, many plant species were brought by them from Persia and Central Asia where herbaceous and bulbous flowers were already under cultivation. Many of these have been mentioned in autobiographies and other books written during those days. Besides, in the Mughal paintings also we find illustrations of many flowers. These have also been used to illustrate the borders of those paintings. In the book *Bagh-i-wafa,* the emperor Babur has presented a description of gardening in India. The Mughal emperors introduced several types of plants, many of which were planted in Kashmir where the climate was more suitable for the growth of such plants than that of the plains. The species brought by them included the famous Chenar tree, which is the most beautiful tree in Kashmir even today, besides roses, carnations, irises, narcissuses, daffodils, lilies, tulips and others. The rose was introduced into our country via the port of Bussorah by Babur in the year 1526 or so. Jehangir and Nurjehan were ardent lovers of the rose and encouraged rose-growing in gardens

Later, during the British period many species were introduced mainly by Englishmen and the Portuguese. These were mostly brought in by missionaries and priests, civil servants and individual amateur gardeners. One of the important missionaries who introduced a number of exotic plants was Dr. Firminger, an Englishman, who wrote a book on gardening, giving descriptions of various species of flowers in the year 1863. The book entitled 'Firminger's Manual of Gardening in India' is an authoritative reference book on ornamental flowering plants even today.

Several of our native flowers, particularly the attractive flora of the Himalayas including many alpine species, have been introduced into other countries. During the early British period in India, when some famous gardens were being developed in Great Britain, several plant collectors came to our country in search of beautiful wild flowers. The wealth of the Himalayan flora was taken to England in the early part of this century. One of these important plant collectors was Frank Kingdon-Ward, who visited Assam and Burma about five to seven times during the years 1938 to 1956. He discovered the blue poppy *(Meconopsis)* for the first time. Ludlow and Sherriff went to Kashmir during the year 1939-1941 besides visiting other areas like Tibet and Bhutan. There were similar expeditions to Nepal also. Several other botanists and plant hunters also came from many other European countries and the U.S.A. to our country in search of wild ornamental flowers. As a result of these plant collections, many wild flowers including many alpines like several species of *Primula,* Orchids, *Aconitum, Androsace, Anemone, Aquilegia, Aster, Bergenia, Campanula, Corydalis, Delphinium, Erigeron, Gentiana, Geum, Saxifraga, Allium, Fritillaria, Lilium, Iris, Meconopsis, Paeonia, Clematis, Cornus, Prunus, Rhododendron, Sorbus, Viburnum* and several others were introduced from India from their wild habitat into England and other European countries. Some of these, like the blue poppy (*Meconopsis*), *Clematis montana,* many species of orchids, rhododendrons and primula, balsam, begonia, foxtail lily *(Eremurus himalaicus),* Gloriosa lily *(Glorisa superba),* musk rose *(Rosa moschata)* etc, are now widely grown in gardens in several parts of the world. Several species of orchids and rhododendrons, which are native of India, have been extensively used in breeding new varieties and hybrids. Most of the plants species introduced from India into Great Britain are being maintained in the Kew and Edinburgh Botanic Gardens. Unfortunately, many of us in India are not aware of our rich heritage of native flowers.

CHAPTER III

Uses of Flowers in the Garden

IN ANY GARDEN THE MAIN KINDS OF FLOWERING PLAnts are trees, shrubs, climbers, herbaceous annuals biennials and perennials, and bulbous plants, For permenent plantings, ornamental trees, shrubs and climbers are commonly used. Since this book does not deal with trees, shrubs and climbers, as mentioned earlier, it is not considered appropriate to describe their uses here.

The harbaceous annuals and biennials have varied uses in a garden. They are generally grown in beds and in informal borders with or without perennials and bulbous flowers, particularly in a mixed border to obtain a longer duration of flowering. Annuals are often grown grouped in an informal border. The border is situated in front of a hedge or shrubbery or along paths. The flowers are massed irregularly with respect to their height but grouped in suitable colour combinations to produce harmonious, natural and pleasing effects. In a border there must be a synchronization of flowering of all plants and therefore late flowering species like hollyhock, carnation, etc., should be planted earlier than others.

The annuals are also grown in front of a shrubbery or among the shrubs, particularly in a newly planted shrubbery, to produce a quick and colourful effect. For this purpose, tall annuals like larkspur, hollyhock, cosmos, salpiglossis, nicotiana, etc., are ideal. When a new garden is being laid out, it is useful to grow annuals for a quick colour display at least till such time as it is permanently established.

They are also ideal for growing in pots or containers. The annuals best suited for this purpose are aster, carnation, calendula, petunia, pansy and viola, cineraria, cockscomb, schizanthus, nemesia, mimulus, brachycome, nasturtium, phlox, salvia, stocks, zinnia, marigold and a few others. For hanging baskets, viola, sweet alyssum, nasturtium, French marigold and matricaria are well suited. A few like portulaca, calendula, sweet alyssum, verbena, phlox, pansy, viola, aster, French marigold, gazania, lobelia, nasturtium and petunia are useful for growing in window boxes.

There are several beautiful annual climbers which can be used for growing on walls, trellis-screens or pergolas. They are also grown on old tree-stumps and fences. The important annual climbers are sweet pea, nusturtium, morning glory, cardinal climber, canary creeper, *clitorea ternatea* and a few others.

The dwarf annuals, such as low-growing antirrhinum, alyssum, dimorphotheca, eschscholzia, gazania, godetia, linaria, mesembryanthemum, portulaca, brachycome, verbena and viola are suitable for growing in rock gardens.

Many annuals are excellent subjects for cut flowers, such as aster, arctotis, carnation, annual chrysanthemum, clarkia, coreopsis, cornflower, cosmos, dahlia, dimorphotheca, larkspur, statice, linaria, lupin, marigold, Bells of Ireland, nemesia, poppy, scabious, stock, sunflower, sweet sultan, brachycome, sweet pea, Sweet William and zinnia. Dried flowers of a few annuals, such as acroclinum, helichrysum, statice and Bells of Ireland, are also commonly used for decoration.

There are some which are suitable for edgings and borders along the paths, such as sweet alyssum, dwarf French marigold, phlox, petunia, nemesia, etc. A few can be successfully grown in partial shade, such as cineraria, pansy, viola, salvia, ageratum, begonia, daisy (Bellis), campanula, lupins and mimulus, while some can be grown in dry locations, such as portulaca, verbena and nasturtium.

For ground covers, sweet alyssum, verbena (perennial), viola, pansy, portulaca and mesembryanthemum are well suited. Pansy, viola, mesembryanthemum and portulaca are also useful for growing under standard roses to cover the ground. Annuals can also be grown in the beds of bulbous flowers to fill in the bare spots and to provide colour when the bulbs are not in flower. A few tall-growing flowers, like hollyhock, larkspur, tithonia, sunflower, annual chrysanthemum and African marigold are useful for fence-planting.

Besides, there are some annuals which are much prized for their sweet-scented flowers, such as sweet pea, stock, carnation, sweet alyssum, verbena, mignonette and nicotiana. Among the bulbous plants having scented flowers, the important ones are tuberose, eucharis, daffodil, narcissus and freesia

For naturalizing, bulbous flowering plants are excellent subjects. One does not need much help to tend them. Nowadays, when home gardens are smaller, there is a pressing need to naturalize rather than cultivate gardens in formal style. For naturalizing, bulbous flowers may be planted in groups under trees, in the shrubbery, along walks, in the rockery, along the edge of a waterpool, in clumps, in drifts on grass or in an informal herbaceous border where they can stay permanently. They will provide colour at different times of the year without much care, except occasional dividing, replanting and manuring. Only those bulbs which are hardy, can multiply easily and remain in the ground without much damage to the bulbs should be chosen for naturalizing. Besides hardiness, height of plant, time and duration of flowering, colour of flowers, size of blooms, etc., are other considerations in choosing plants. The bulbous flowers suitable for naturalizing under our conditions in the plains are narcissus, amaryllis, eucharis, easter lily, iris, crinum, tuberose, nerine, spider lily, day lily and zephyranthes. On the hills, narcissuses, tulips, daffodils, anemones, lilies and irises are the best subjects for naturalizing.

CHAPTER IV

Method of Cultivation

IN INDIA GENERALLY THREE BROAD TYPES OF SEASONAL flowers are grown on the northern plains where there is a cool winter season. These three types are winter, summer and rainy season annuals. Under warmer conditions in South India where there is practically no winter season, common winter annuals like carnation, sweet pea, antirrhinum, pansy, viola, etc., cannot be grown successfully. However, in a milder climate prevailing in Bangalore and Pune it is possible to grow almost all types of annuals.

Among the winter season annuals, the important flowers are antirrhinum, aster, ageratum, brachycome, carnation, calendula, cineraria, clarkia, dimorphotheca, dianthus, godetia, larkspur, linaria, mimulus, nasturtium, nemesia, pansy, petunia, phlox, salvia, schizanthus, stock, verbena and viola. The summer-flowering annuals are cosmos, sunflower, portulaca, tithonia, coreopsis, zinnia and gaillardia. Almost all of them as well as balsam, torenia, cockscomb, gomphrena and marigold can be grown in the rainy season. The time of sowing of the annuals depends upon the climate and varies in different parts of India. On the northern plains, the winter annuals are generally sown in September-October except a few late-flowering ones like aster, carnation and cineraria, which are sown earlier in August-September. The summer annuals are sown from January to June, while those of the rainy season are sown at the commencement of rains or a little earlier, in June or July. In South India, the best time to sow annuals is September-October. On the northern hills the most appropriate time for sowing is March to May or August to October (for hardy annuals). The annuals are sown from March to May and December to January on the southern hills, e.g., Ootacamund (Nilgiris), Kodaikanal, etc.

In our country the herbaceous annuals, biennials and perennials are usually grown in the open, while in other countries they are also grown in glass-houses. Many annuals like aster, carnation, petunia, cineraria, pansy, salvia, phlox, etc., are grown in pots. About 20-to 25-cm pots are quite suitable for this purpose. Before using old pots, they should be cleaned thoroughly and the previous soil removed. A potting mixture containing two parts soil, one part well-rotten cowdung manure, one part leafmould and a little amount of sand, particularly if the soil is heavy, may be used to grow most of the annuals.

Sowing of Seeds—Seeds of most annuals are sown in a nursery to raise seedlings for transplanting later. However, a few annuals, particularly those which have either bold seeds like sweet pea, morning glory, lupins and nasturtium or are difficult to transplant, such as linaria and eschscholzia, may be sown directly at the permanent sites where they are to flower and spaced adequately by thinning out after germination.

Seeds are sown in raised nursery beds, earthen seed-pots or pans or wooden seed-trays. The soil in which seeds are to be sown should be sterilized before sowing to prevent 'damping-off' which often kills young seedlings. Sterilization of soil can be done by heating. Take a saucepan and fill it half with water. Boil the water to about 95°C, on a stove. Place the soil in a small metal container and put this container in hot water in the saucepan for about 30 to 40 minutes at 95°C, taking care to see that the water kept in the saucepan does not enter the container having soil in it. Afterwards take out the soil and spread it out on a piece of clean paper or cloth to dry before using it in the seed-pans. The other method of sterilization of soil is to treat it with two per cent formalin or fomaldehyde, mix it well and cover it with a gunny bag for 48 hours. Afterwards it is spread out on tarpaulin or gunny bags to dry before using it.

Always sterlized soil should be used for sowing. The best mixture for sowing should contain two parts loam, one part leafmould and one part coarse sand. The seeding mixture should be made very fine before filling it in the seed-pans or trays.

Seeds may also be treated with some fungicides such as Captan, Fytolan or Arsan before sowing to ensure healthy seedlings. Thin and even sowing of seeds is necessary to avoid "damping-off". Very small seeds like those of petunia may be mixed with a little quantity of sand while sowing to have a uniform placement of seeds.

With the help of a pencil or a small wooden stick open straight rows about 6 cm apart and 0.3 to 0.6 cm deep. Sow the seeds in these rows and cover them with finely sifted sand or leafmould. Water the pans after sowing with a watering-can having a very fine hose. While doing overhead watering, due care should be taken to prevent the washing away of very fine seeds. Watering in seed pan from below is useful in the case of fine seeds. The seed-pan is placed in a container filled with water taking care that the water does not reach the top of the seed-pan and kept submerged in water until the water reaches the surface of the soil. Watering from bottom, as described here, will keep the fine seeds moist and not overwatered.

After sowing, cover the seed-pan with a glass sheet or a newspaper sheet and for a few days keep it in partial shade. After germination, remove the cover and keep the pan in sunlight, otherwise the seedlings if grown in darkness will become weak and lanky.

Pricking out—The young seedlings are often pricked out by transferring them to another seed-pan or tray. They are spaced about 5-7 cm apart. The soil mixture used is slightly richer than the previous one used for sowing seeds. Extreme care should be taken to avoid damage while taking out and transferring the seedlings. After putting the seedlings in the holes made in the new seed tray or pan, firm and soil properly, particularly around the neck of the seedlings. Pricking helps in better growth of seedlings.

Transplanting—The seedling are usually transplanted after about a month of sowing when they have developed about three to four leaves. Before transplanting, the seedlings should be hardened off by withholding water for one or two days. Transplanting is usually done on a cloudy day or in the evenings to avoid bright sunlight, as the cool night temperature is beneficial in establishment of seedlings. The bed which is to receive the seedlings is well prepared by adding adequate manure, usually one bucketful of well decomposed cowdung manure and about 45 gm superphosphate or bonemeal per sq. metre. The soil around the neck of the seedling should be properly firmed. Immediately after transplanting, the beds should be watered thoroughly.

In foreign countries, individual seedlings are often grown in a jiffy pot which itself along with the seedling is put in the beds. Transplanting in this manner ensures better establishment of seedlings as they remain almost undisturbed during transplanting. Similarly, in recent years, several commercial seed and plant starters are available abroad, which are 'ready made' containing seeds, compost, etc. One has simply to open the lid of the container and water as the seed is already put in the sterile seeding mixture. Sometimes one gets a complete sowing-kit containing seeds, seeding mixture, labels, etc., and just sows the seeds and water to raise seedlings without much preparation.

After-care After the transplanting of seedlings, the beds may be weeded, hoed and watered regularly. In some annuals like sweet pea and carnation, staking of plants is necessary. After a few weeks of growth, the seedlings may be pinched to make them bushy but it is not practised in the case of antirrhinum, larkspur, lupin, stock, hollyhock, etc. During the early growth of seedlings, a top dressing of ammonium sulphate is beneficial.

A careful check may be made of diseases and insect pests and prompt control measures adopted to control them. The faded blooms should be regularly removed as it helps to prolong flowering.

CHAPTER V

Diseases and Insect Pests

THE COMMON DISEASES WHICH AFFECT HERBACEOUS annuals and biennials and other ornamental plants are described below.

Damping-off—The disease is noticed in the nursery and the very young seedlings of most annuals collapse and die as a result of a fungus attack in the roots or at the base of the stems. 'Damping-off' is common in stock, sweet pea, larkspur, clarkia, aster, carnation and several other annuals. Thick seed-sowing and over-watering often result in 'damping-off'. It is, therefore, necessary to sterlize the soil before sowing, as described earlier, and to sow thinly and water lightly with great care. Application of cheshnut compound (ammonium carbonate fresh two parts of copper sulphate two parts well mixed and shaken and stored for 24 hours) at the rate of 3 gm per litre of water as a spray and soil drench is effective in controlling the 'damping-off'. A plant spray or soil drench of Captan (2 gram in one litre) of water) is also useful.

Leafspot and Blight—It is a common disease in chrysanthemums caused by two fungi (*Septoria chrysanthemi* and *Phyllosticta* sp). It causes necrotic spots on leaves. Spraying the plants with Fytolan is effective in controlling the disease. In jasmines the leafspot disease is caused by *Cercospora jasminicola.* The disease affects leaves, shoots and flowers which dry up. A spraying with any copper fungicide or copper oxychloride or Dithane M-45 is helpful in controlling the disease.

The leaf smut disease caused by a fungus *(Entyloma dahliae)* is found in dahlia. The spots are produced on the leaves which later dry up. The diseased leaves should be burnt as they are the source of further infection. Diseased plants may be sprayed with Bordeaux mixture or Fytolan.

In carnations blight is an important disease. It is caused by the fungi *Saponaria* sp. and *Alternaria dianthi* and occurs from March onwards. The diseased leaves dry up and die. A spraying with Bordeaux mixture (4:4:50) or Fytolan is quite effective in controlling the disease. The diseased plants should be burnt and destroyed. Spraying of Benlate is effective against leaf spot diseases.

Foot rot-It is a soil-borne disease caused by *Pythium* sp. and it starts in the nursery. It is common in balsam, aster and other annuals. Usually black lesions are produced on the main stem at the ground level and later on other branches also. It kills the young seedlings in the nursery as well as grown-up plants. Spraying the plants or drenching the soil with cheshnut compound is helpful in controlling the disease.

Powdery Mildew – This disease is caused by a group of fungi which produce a white powdery coating on the foliage. It is commonly found in roses, balsams, zinnias, phloxes, lupins, larkspurs, sweet peas and delphiniums. Dusting or spraying with sulphur is effective in controlling the disease. A spraying with Karathane also helps. Sprays of Benlate or Bavistin are also effective, particularly in roses.

Downy Mildew – The disease is common in poppy (*Papaver* sp.) and is caused by the fungus *Perosnospora arborescens.* It occurs during late February or early March. The symptoms produced include yellow or light brown blotches on the upper surface with a greyish mouldy growth on the corresponding spots on the lower surface of the leaf. The diseased leaves should be burnt. Use of disease-free seed and spraying of plants with Fytolan or Dithane Z-78 are effective against this disease.

Root-Rot– The disease is caused by various soil-borne fungi. It attacks the rose, nasturtium, *Nicotiana,* sweet pea, gerbera and antirrhinum. Application of cheshnut compound is effective in it.

Virus diseases– In zinnia, leaf curl virus is a common disease which kills the whole plant. Aster suffers from the aster-yellows disease. Virus diseases are also found in marigold, *Vinca rosea,* schizanthus, rudbeckia, primula, petunia, *Nicotiana,* lobelia, chrysanthemum and dahlia. The diseased plants should be uprooted and burnt.

Rust–This disease is caused by fungi and attacks marigold, antirrhinum, rudbeckia, linaria, gomphrena, celosia, hollyhock, stock and a few other annuals. Use of rust-resistant varieties of antirrhinum is recommended.

Wilt–The disease is caused by several kinds of soil fungi or bacteria. It occurs in nasturtium, carnation and aster. Sterilization of soil and treatment of seeds before sowing are quite effective in controlling the disease.

INSECT PESTS

Aphids –These are small sucking type of insects which attack several plants such as rose, dahlia, nasturtium, chysanthemum, zinnia, petunia, stock, lupin, sweet pea, carnation, larkspur and a few others. Aphids can be controlled by spraying or dusting the plants with malathion, rogor, or metasystox.

Beetles and Weevils – The chafer grub is common in roses. Beetles are found in water-lily, petunia, marigold, aster, gomphrena, morning glory and celosia, while weevils attack primula, lupin and a few others. Spraying or dusting the plants with DDT is effective in controlling these pests. Aldrin, Thimet and Sevin are also useful insecticides for controlling beetles and weevils.

Thrips – These are found in gladiolus, lily, iris and freesia. They also attack roses, lupin, nasturtium carnation and chrysanthemum. A spray of malathion, rogor, ekalux or thiodan is helpful in controlling this pest.

Cut Worm –They attack carnation, gomphrena, chrysanthemum and a few others. Dusting the ground with aldrin or DDT will control the pest. Sevin is also effective against cut worm.

Caterpillars –Caterpillars are commonly seen in gladiolus, dahlia, hollyhock, antirrhinum and aster. To control them, dust or spray the infected plants with Sevin.

Scale Insects –The red scale is a common insect pest of roses. Spraying with parathion or sumithion is effective in controlling this pest.

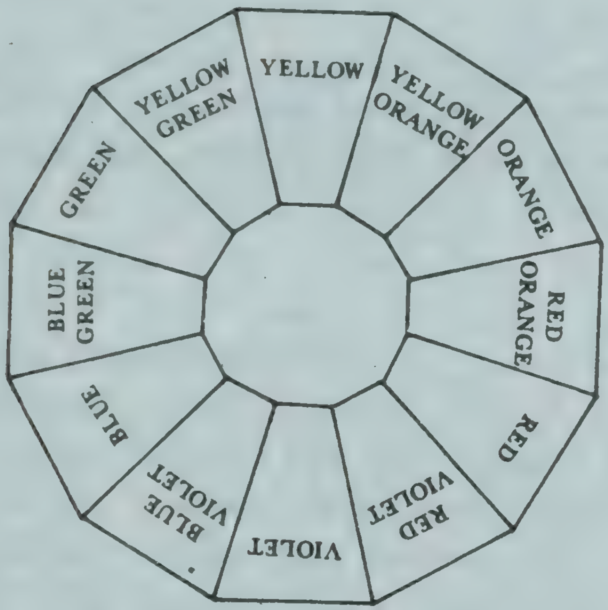
CHAPTER VI

Colour Schemes with Annuals

FOR QUICK SEASONAL COLOUR IN THE GARDEN FAST-growing annuals with a variety of flower colours in every imaginable hue are unsurpassed. Within a very short time, in some cases as little as six to eight weeks from seed to flower, the annuals produce a riot of colour. While working out a colour scheme with annuals in a garden, the same basic principles of colour are used as those adopted by an artist or an interior decorator. Combining annuals of different colours to produce a pleasing and restful effect is most rewarding. However, a basic knowledge of colours and their relationships is essential in working out any striking colour scheme.

Sunlight is composed of eight rays, namely, infra-red, red, orange, yellow, green, blue, violet and ultra-violet, of which the two (infra-red and ultra-violet) at the two extremities are invisible to the naked eye. When sunlight falls on a flower, the latter absorbs all the rays except the one similar to its colour which is reflected by its surface and becomes perceptible to our vision. A flower appears red because it absorbs all the rays of sunlight except red which is reflected by the flower petals and is thus made visible to us. To understand colours and their relationships, it is useful to become familiar with the colour wheel *(see next page).*

The six basic colours or hues comprise red, yellow and blue and three secondary colours, such as orange, green and violet. The primary colours are equally spaced around the colour wheel forming a triangle and in between them are the



COLOUR WHEEL

secondary colours. Combining them we get six other colours, such as red-orange, yellow-orange, yellow-green, blue-green, blue-violet and red-violet. Each colour which forms a wedge or triangle has a range of different values from light to dark known as chromatic values. The 'true' colour is in the centre of the wedge and becomes gradually lighter in value towards the centre and darker towards the outside of the circle. The warm colours are red, orange and yellow, while the cool ones are blue, green and violet. The neutral colours are black, white and grey. The colours facing each other across the colour wheel are called complementary, such as red and green, and orange and blue. These are contrasting colours but they neutralize or complement each other, when mixed together. The graduated mixtures of the three primary colours lying in between them are related and known as harmonious colours. The closer these adjoining colours are, the less is the difference between them.

A colour scheme may be monochromatic with different shades or tones of the same colour; analogous using closely related colours like green and yellow-green or yellow and yellow-orange; complementary having two opposite or contrasting colours like blue and orange or violet and yellow; split-complements with three colours, one dominant like violet with yellow-green and yellow-orange, as two neighbouring complements or triads having three colours like red, yellow and blue or orange, yellow and violet. Contrasts, harmonies and subordination are the three important aspects of a garden colour scheme. A few contrasts using complementary colours are needed to produce gay and brilliant effects, particularly as accents or foils to harmonious colours. If not used judiciously and carefully, the contrast may make a garden appear spotty and restless. Sometimes a soft contrast with the use of subdued and neutral shades can be more effective than a vivid colour combination. Red salvias against the background of a bright green hedge make a good contrast. A harmonious colour scheme is commonly adopted by using closely related colours, both warm and cool. The different varieties of the same flower having different hues both warm and cool, such as those available in petunia, sweet pea, aster, antirrhinum and phlox can be best utilized for this purpose. Orange antirrhinums with yellow marigolds are harmonious warm colours. Subordination is also important in garden colour schemes in which there is a single dominant colour to which all other colours are subordinate. Usually green is the dominant colour in the garden at most times of the year. In spring yellow is predominant, while bright warm colours are most common in winter. In some plantings there is always one dominant colour, such as yellow in different shades is dominant in the Buddha Jayanti Park, New Delhi.

For a monochromatic scheme, plant blue petunias with blue ageratum or lobelia, pink snapdragons with pink sweet alyssum, orange calendula with orange dimorphotheca, nasturtium and marigolds or yellow antirrhinum with yellow calendula, eschscholzia and viola. Yellow snapdragons, red phlox or petunia and white sweet alyssum or candytuft can be grown for a brilliant contrast. The other contrasting or complementary colours may be yellow antirrhinum with blue or purple verbena, scarlet dahlia or antirrhinum with yellow-orange nemesia, blue ageratum and violet petunia, stock or verbena. For a soft contrast, plant different varieties of phlox, sweet pea, petunia, aster, zinnia and antirrhinum in which blue, violet, pink, mauve and white flower colours are available.

While grouping the annuals, particularly in a herbaceous border, plant-height, form and size of flowers and time of flowering are important considerations, besides the colour of blooms. Tall plants like antirrhinum, hollyhock, larkspur, dahlia and cosmos should be planted at the back, while semi-tall and dwarf annuals like nemesia, phlox, petunia, aster, calendula, verbena, dianthus, French marigold, nasturtium and stock may be grown in the centre and for edging in the foreground pansy, viola and sweet alyssum are most useful. Tall yellow snapdragons with long spikes of flowers may contrast well with the clustered flat heads of red or pink phlox or Sweet William in the centre and low-growing white small-flowered sweet alyssum in the front. Sometimes the monotony of a particular bright warm colour like red, yellow or scarlet can be overcome by interplanting white-flowered plants or cool-coloured blues or violets here and there in the row. It is also necessary to harmonise the colour of the annuals with that of the other plants in the garden, such as trees, shrubs, climbers and hedge plants. The colour, texture and form of foliage and flowers of shrubs and hedge plants when planted in the background should also harmonise with or complement that of the annuals grown in the front.

There can be numerous combinations of colours using various annuals in a garden. However, with a basic knowledge of colour and its relationships and one's personal preferences, one will be able to work out very pleasing and restful effects. One can produce amazing and delightful colour effects with annuals in the garden as quickly and easily as an artist does with brush and paint on the canvas.

CHAPTER VII

Description of Flowers

Annual and Biennial Flowers

PHEASANT'S EYE

Adonis aestivalis

FAMILY: Ranunculaceae *ORIGIN:* Europe

THE PHEASANT'S EYE *(ADONIS AESTIVALIS)* IS A NATIVE of Central Europe. It is not a very common flower grown in our country. The plant is medium-tall (30-45 cm), having dark green finely-cut fern-like foliage. The flowers are 2.5 cm across, butter-like, deep crimson, with dark centres. Another species *A. autumnalis* with crimson flowers is also grown in the garden.

It thrives best in a moist and shady situation. The plant is suitable for growing in rockeries, mixed borders, annual borders and pots. The seeds are sown in October in the northern plains where the plant flowers during February or March. In the hills it can be sown during February-March or autumn. The seedlings are transplanted a month after sowing.

FLOSS FLOWER

Ageratum (A. conzoides and A. houstonianum or A. mexicanum)

FAMILY: Compositae *ORIGIN:* Central America

The garden varieties of ageratum have been derived from two species, namely, *A. conzoides* and *A. houstonianum (A. mexicanum).* The height of the plant varies from 15-45 cm. The leaves are small, ovate and toothed. Flowers are pale lavender to deep mauve including azure blue and dark blue in colour. In some varieties (Imperial Dwarf White) the flowers are white. The fine feathery or fluffy heads of flowers are borne in clusters well above the foliage.

The dwarf varieties are ideal for edging and rockeries. The tall varieties may be grown in beds. The ageratum is also suitable for growing in pots. The flowers are useful for cutting.

Its fine seeds are sown thinly and covered lightly with sand or leafmould. The seedlings are transplanted into beds or pots after about a month of sowing. The seeds can be sown in September-October or during June to September for earlier flowering. In the hills it is sown in February or March. The faded flowers should be removed frequently to prolong flowering and improve the appearance of the plant.

The various important varieties are the Blue (dark blue), Midget Blue (blue), Little Dorrit (azure blue), Coeruleum (blue), Blue Perfection (blue), Blue Miniature (dark blue), Blue Bedder (lavender blue), Fairy Pink (salmon and light pink) and Imperial Dwarf (White). A tetraploid variety, Blue Mink, having unusually large blue flowers covering the dwarf (15-20 cm) compact plants and free blooming, is also available.

A few F_1 hybrids like the Summer Skies and Blue Blazer with more uniform plants and flowering are also available.

CORNCOCKLE

Agrostemma githago 'Milas'

FAMILY: Caryophyllaceae *ORIGIN:* Europe and Western Asia

The common *Agrostemma githago* is popularly known as corncockle. The variety 'Milas' is from Turkey. It is a tall (65-90 cm) plant with slender stems, long narrow leaves and pale lilac or rosy lilac viscaria-like flowers with five petals which are 5-7 cm across with radial lines of dark dots marked on each petal.

It is a nice flower for growing in annual and mixed borders or in pots and is useful as cut flowers. The seeds are sown in the nursery-bed in September or October in the plains. The flowering takes place during February and March. In the hills it can be sown during spring, February-March or in autumn.

HOLLYHOCK

Althaea rosea

FAMILY: Malvaceae *ORIGIN:* Orient, China

In the plains the hollyhock is treated as an annual, while in the hills it can be grown as a perennial. It is a tall (1.5-2.5 m) majestic plant with large round rough kidney-shaped leaves. The flowers are borne in the axils of leaves along the stem and are without stalks and large in size (8-13 cm). The flower colour ranges from white and cream to yellow, pink, purple scarlet, crimson, mauve, lilac, rose, apricot and many other shades. The flowers may be single, semi-double or double. The double-flowered varieties always throw out a few singles and semi-doubles. In some varieties the flowers are fringed and carnation-flowered.

It is an ideal plant for backgrounds in mixed and annual borders or for growing in the open spaces in a shrubbery, especially in a newly-planted one, to fill in the vacant areas. This may be used for covering unsightly places or to serve as a screen. It can also be planted in front of a dark green hedge to produce a bold and colourful effect. The plants may be grown either in groups or in rows. A deep, rich and well-drained soil is necessary for its successful cultivation.

The seeds are best sown directly at the permanent sites and the seedlings are thinned out later, maintaining a distance of 45-60 cm between plants. The seeds are sown in September or October in the plains. While sowing it in an annual border, it is necessary to sow it at least one month earlier than others in order to synchronise its flowering with other flowers. The plants take about 3½ to 5 months to flower after sowing. In regions having a low rainfall, it can be grown during the rainy season also. It may even be grown almost throughout the year in areas having a mild climate. In the hills, the hollyhock is sown during August to October to flower during spring and early summer.

The single, semi-double Indian sprig with bright rose semi-double fringed flowers and Double Triumph—an early medium tall variety with fringed and waved double flowers in various colours—are the important varieties suitable for growing in the plains. The Giant Double, a late variety having large (10-12 cm across), carnation-like flowers with fringed or waved petals, and Chater's Double with large double blooms in various colours can be grown successfully in the hills only, as both the varieties are late-flowering and require a cold climate for best growth. Chater's Double Hybrida Semperflorens and Fordhook Giants are the best biennial or perennial varieties. Recently, the Power puff variety has become popular in which the flowers are extra double and are like a powderpuff in in appearance and they are more prominent and showy as the leaves are smaller than those in older varieties.

SWEET ALYSSUM

Alyssum maritimum (Lobularia maritima)

Other common name: Madwort

FAMILY: Cruciferae *ORIGIN:* Europe and Western Asia

The plant is low-growing (35.5 cm) and spreading with small narrow light green leaves which are almost entirely covered by the flowers. Each branch produces a spike of minute white sweetly scented flowers and the compact plant appears like a white carpet of flowers. In some varieties the flowers are purple, rose, violet or lilac in colour.

The sweet alyssum is excellent for beds, borders, edgings, window-boxes, hanging-baskets and pots. It can be grown in the front row of an annual border. It is also ideal for growing in rockeries and along pavements or garden-paths among stones or on a dry wall. It is good too as a cover in a bed of spring or summer-blooming bulbs and for growing near the base of standard roses and along paths.

The seeds are sown in September-October in nursery-beds and seedlings are transplanted later about a month after sowing. The distance between plants is about 20-30 cm. The plants flower early in about six weeks after sowing. Sowing in the hills can be done in February-March. While sowing the tiny seeds should be mixed with sand to facilitate uniform placing.

The variety *minimum* having a procumbent habit is very dwarfish, being only 5 cm high and forms a very compact dense low-growing carpet of flowers. This includes the varieties Royal Carpet (violet purple), Rosie o' Day (deep rose), Snow Carpet (white), Little Gem (white), Pink Heather (rose), Violet Queen and the early-flowering Benthamii with white flowers. There is also a tetraploid variety known as the Tetra Snowdrift which is low, bushy and very vigorous-growing with larger flower-heads than any other variety.

AMARANTH

Amaranthus

FAMILY: Amaranthaceae *ORIGIN:* Tropics

The amaranths include some of the most beautiful foliage plants. The love-lies-bleeding *(Amaranthus caudatus)* is a tall plant (90-150 cm), having drooping tail-like purplish-crimson, pale green or white flower-spikes. The upright crimson-red, plume-like spikes of the Prince's Feather *(A. hybridus* or *A. hypochondriacus)* borne above the light green foliage are also very attractive. Its height is 90 cm. Joseph's Coat *(A. tricolour splendens)*, a medium-tall species (45-90 cm), possesses rich scarlet foliage coloured yellow and bronze green, while in the variety *ruber (A. tricolour ruber)*, the foliage is bright red. The foliage in the Chameleon or Fountain Amaranthus *(A. salicifolius)* is long, undulating or drooping like a willow and brilliantly-coloured with bronze, orange and carmine. The plant is tall, about 60-90 cm high. The Molten Fire or Summer Poinsettia *(A. bicolor)* bears deep maroon foliage, each with a brilliant crimson top like a Poinsettia. A few very attractive ornamental amaranths have been developed at the National Botanical Research Institute, Lucknow (U.P.).

The amaranthus species require a warm and moist soil and a sunny situation. In semi-shaded situations, the variegated colour of the foliage does not develop fully. The amaranthus species are suitable for growing in groups or rows in the mixed or annual border and for pot culture. They can also be grown in groups to produce bold and striking effects from their flamboyant colours. As far as possible, they should not be grown mixed with other flowers as their brilliant foliage colour becomes very prominent.

The seeds are sown in the permanent places and the seedlings thinned out after germination. Transplanting of seedlings can also be done, if required. The best time to sow them is during January-February or June-July. The plants can be successfully grown during summer and the rainy season but the growth is better during the latter season. In the hills, the sowing can be done in February or March.

ALKANET

Anchusa capensis

Other common names: Bugloss, Cape Forget-me-not

FAMILY: Boraginaceae *ORIGIN:* South Africa

In its native home, *Anchusa capensis* is a biennial but it can be grown as an annual in the garden. It thrives well in the hills and also in the plains where there is a long and cool winter.

The plant is medium-tall (35-45 cm), compact, profuse-blooming with narrow and lance-shaped rough-textured leaves. The flowers are bright blue, about 0.63 cm across with a white centre, borne freely in clusters on branching stems. The flowers resemble the forget-me-not but are a little larger in size.

Anchusa is useful to combine with yellow-flowered annuals like the dwarf yellow French marigold or the yellow snapdragon. It can also be grown with pink antirrhinum or blue salvia with an edging of petunia. It appears attractive when planted in drifts.

The seeds are sown either directly at the permanent sites or in a nursery-bed for transplanting the seedlings later. The seeds can be sown during September-October in the northern plains and in March-April or during autumn (August to September) in the hills. The plants thrive best in a sunny situation and a well-drained and rich soil. They are spaced about 30-45 cm apart in the beds and need staking.

The best variety available is the Blue Bird which produces blue flowers with a white centre. The variety Bedding Bright Blue has azure-blue flowers.

The perennial tall-growing (about 1.5 m) species *A. italica,* a native of the Caucasus, can be grown successfully as a biennial in the hills. The sowing may be done in autumn. The important varieties are Dropmore (gentian blue), Morning Glory (blue), Pride of Dover (azure blue) and Royal Blue.

SNAPDRAGON
Antirrhinum majus

Other common name: Antirrhinum

FAMILY: Scrophulariaceae *ORIGIN:* Europe

The snapdragon is one of the most favourite annuals grown in the garden. It is a stately plant with small narrow smooth leaves and tubular flowers with spreading irregular lobes borne in tall spikes. There is a wide and spectacular range of flower colours from white, cream and yellow to several shades of pink, crimson, scarlet, red, terra-cotta, orange, lilac, mauve, rose, orange-red and maroon. The shape of the flower is like a bunny-mouth or a dragon's jaw and the lips may open wide when gently pressed with the thumb and the fore-finger. The size of flower also varies with the variety. The plant may be tall (90-120 cm), intermediate (60-75 cm) or dwarf (30-45 cm). There are also varieties with ruffled or double flowers.

The tall antirrhinums can be grown in the background of an annual or mixed border or in a shrubbery along with hollyhock and larkspur. They are also used as tall accents in small gardens. For growing in beds or pots the intermediate forms are ideal, while the dwarf ones are best for edgings and rock gardens. The dwarf varieties are also useful for growing in raised beds. The flowers are excellent for cutting and last for a long time in the vase. The Rock Hybrids are ideal for rock gardens. The dwarf varieties including Tom Thumb, Magic Carpet and Rock Hybrids are useful for growing in window-boxes.

The seeds are sown in a nursery-bed in September or October and the seedlings transplanted after about a month when these have developed four leaves. In areas having a low rainfall, sowing can also be done in June-July. Its small seeds should be sown carefully and covered with a thin layer of sand or leafmould and watered very carefully. The plants flower within 2½ to 4 months of sowing depending upon the variety and flowering continues for a long period. In the hills they can be sown during February-March or autumn (August-September), the later sowing being preferable when the plants are to be grown in pots. Some gardeners practise pinching but it is not necessary because it reduces the size of flower-spikes though their number is increased. For obtaining tall and quality spikes, pinching should not be adopted. Staking of plants is also not needed. The plants require a rich soil with organic manure present in it. Sometimes in a light and poor soil, it may be beneficial to apply about a teaspoonful each of ammonium sulphate and sulphate of potash to each plant after about 30 to 45 days of transplanting to encourage vegetative growth and flowering. The fertilizer should be hoed into the soil around the base of the plant and watered heavily immediately. The faded flower-spikes should be removed frequently to avoid the setting of seeds and thus prolong flowering.

The plant is highly susceptible to the rust disease. There are several rust-resistant varieties which are commonly grown in the gardens.

There are numerous varieties of antirrhinum which include Tall, Giant or Grandiflorum (90-120 cm), Intermediate or Semi-dwarf (60-75 cm), Dwarf or Tom Thumb (30 cm) and Miniature or Magic Carpet (10-15 cm), There are also rust-resistant and hyacinth-flowered varieties. Tetra or tetraploid varieties with larger flowers and the double-flowered varieties having 100 per cent double blooms are also available. Vigorous-growing and uniform floriferous F_1 hybrids like the Rocket Snapdragons, the Supreme, such as Vanguard, Highlife, Super-jet and Venus and the Topper Snapdragons and the recently evolved Floral Carpet are popular. Seeds of F_2 class (generation) are also available in two popular varieties, namely, Panorama and First Ladies. They are stronger and better than the old common varieties but are not quite as uniform as the F_1 hybrids. Recently, the Super-tetra snapdragons like Glacier, Crimsón Giant, High Noon, Rosabel and Volcano have also been introduced which are rust-resistant with extra-large flared or ruffled flowers. Besides these, there are also the tall sentinel snapdragons like Cavalier, Guardsman, Commander, Majorette, Sunlight, Temple and White Spire and the Floradale Giants and the Inverness snapdragons. These varieties are rust-resistant with tall magnificent spikes. Dwarf-growing and spreading Rock Hybrids or Hybrid Gems have been recently produced from crosses between *A. molle* and *A. glutinosum.* They are excellent for growing in rock gardens. Recently, two new varieties, Tinkerbell and Juliana, have been evolved in which the flowers are of a different shape; they have wide and round trumpets with scalloped, slightly ruffled edges and wide-open petals resembling bellflowers.

AFRICAN DAISY

Arctotis

FAMILY: Compositae *ORIGIN:* South Africa

The species *Arctotis grandis (A. stoechadifolia)* is commonly grown in our gardens. It is tall-growing (60-90 cm) plant having small deeply-cut grey-green leaves and silvery-white daisy-like flowers with lilac centres and having the back of the petals steel blue. There are also *A. grandis* hybrids which are vigorous with long-stalked flowers of pale pastel shades of white, ivory, buff and salmon.

Another important species is *A. acaulis (A. scapigera)* which is about 30-45 cm tall with long lobed leaves having white tomentum on the reverse and brilliant orange, yellow and rich bronze-red flowers. The Harlequin Hybrids have various bright colour mixtures.

The Arctotis Special Hybrids or Large-flowered Hybrids have resulted from the interspecific crosses between several species of Arctotis. These are vigorous-growing with grey foliage, which are produced much above the long-stalked large-flowers, about 8-10 cm across. Their flowers may be white, orange, pink, bronze, crimson cream, yellow, dark red and of various wine shades, several of which have attractive centres or zones at the base of the ray petals.

Sultan's Triumph is a hybrid between Venidium and Arctotis which resembles the Arctotis Special Hybrids. It is more vigorous and very bushy in habit with very long flower-stalks and produces gorgeously-coloured flowers in shades of orange, golden, salmon, yellow, bronze, red, wine and bright crimson.

Arctotis is useful for bedding and cutting. The cut flowers can be used for day-time decoration only as the flowers close in the night. It is also useful for growing in pots.

The seeds are sown in nursery-beds in September-October. The plants flower in February-March. In the hills it can be sown during March-April. The plants require a rich soil and a sunny situation. They flower within 3½ to 4 months of sowing.

DAISY OR ENGLISH DAISY

Bellis perennis

FAMILY: Compositae *ORIGIN:* Europe including the British Isles

It is a perennial species but is usually grown as an annual in the plains and as a biennial in the hills. The plants are low-growing (25-30 cm), having small strap-shaped leaves widening towards the end and forming a basal tuft. The stems are thick. The flowers which are about 2.5-5.0 cm across are borne on long (15 cm) stalks. The flower colour may be white, pink or red. There are both single and double-flowered varieties. The petals may be flat or quilled. In the varieties with quilled petals, the flowers are salmon-pink or bright crimson. A dwarfer (15 cm) variety, Lilliput, with double flowers is very free-flowering and its flower colours are white (alba), light rose (rosea delicata), dark rose (rosea) or dark red (kermesina). The double-flowered varieties are Longfellow (dark rose), Snowball (white), Vesuv (ruby red), Chevreuse, giant-flowered Monstrosa and Monstrosa tubulosa (quilled) like Aetna (red, quilled), Monterosa (pink, quilled), Marzensonne (cream-yellow) and Ruby (red).

The daisy is best for growing in beds, borders (edging) and rock gardens. It can also be grown in window-boxes and pots. The plants thrive best in a rich, moist and well-drained soil and partial shade. The cut flowers are useful for decoration in low bowls.

The seeds are sown in nursery-beds in September-October. The flowering takes place in February-March. In the hills the seeds are sown in February-March and the plant can be treated as a biennial. Propagation is also done by division of selected forms in spring.

SWAN RIVER DAISY

Brachycome iberidifolia

FAMILY: Compositae *ORIGIN:* Australia

The Swam River Daisy is a dwarf (30-45 cm), branching plant with small narrow leaves, wiry stems and small flowers, about 2.5 cm across, which are Cineraria-like and of various colours such as blue, pale blue, purple, rose-pink, mauve and white.

It is excellent for growing in pots and for edging in annual borders. It can also be grown effectively in rock gardens. The cut flowers are decorative in bowls.

The seeds are sown in September-October to obtain flowers from January to March. It flowers in 3 to 3½ months after sowing. The seeds are usually sown directly at the permanent sites. It can also be transplanted. The sowing in hills is done during March-April. Since the plants have wiry stems and have a tendency to sprawl, they should be closely (15 cm apart) planted so that they may stand better with their own support. The plants require a medium-loam soil and a sunny situation and should be pinched back to make them bushy.

BROWALLIA

Browallia demissa (B. elata)

Other common name: Amethyst flower

FAMILY: Solanaceae *ORIGIN:* South America

The plant is medium-tall, about 30-45 cm high, with small narrow green oval leaves and tubular Lobelia- or Petunia-like flowers, about 1 cm long, borne in the axils of leaves. The flower colour is blue or violet. Another species, *B. speciosa major*, having bright blue flowers is also grown.

Browallia is an attractive plant for growing in pots. It can also be grown in beds. The plant thrives best in a warm and moist soil and partial shade.

The seed is sown during June-July for growing in the rainy season, particularly in areas having a low rainfall and in September-October for flowering in winter. In the hills it may be sown in March-April. The plant flowers after 2½ to 3 months of sowing.

SLIPPERWORT

Calceolaria

Other common name: Pouch flower

FAMILY: Scrophulariaceae   *ORIGIN:* Central and South America

The *Calceolaria* species are annuals or perennials and herbaceous or shrubby in growth habit. The herbaceous *Calceolaria* species are *C. x herbeohybrida,* a hybrid between *C. crymbosa* and *C. crenatiflora, C. x profusa (C..clibranii)* and *C. x gracilis.* The species *C. x herbeohybrida,* also known as hybrida grandiflora, is a dwarf plant (35-45 cm) with dark green foliage well above which are produced large trusses of gorgeously-coloured slipper-like or pouch-like flowers in a wide range of colours including orange, yellow, red, brown, rose, terra-cotta, apricot, purple and white, many of which are attractively tigered, blotched, spotted and laced in various unique patterns. The species *C. x profusa* is medium-tall (61-90 cm) with medium-sized golden yellow flowers, while the flowers in *C. x gracilis* (45-60 cm) are smaller and of various colours ranging from pastel pale pink to mauve. A dwarf species (25-30 cm), *C. multiflora nana,* bears dainty flowers of various attractive colours like those in *C. x herbeohybrida* mentioned above.

The annual species *C. mexicana* (30 cm) having finely-cut foliage and small pale yellow flowers is successfully grown in the northern plains.

The calceolarias are excellent for growing in pots. They thrive best in a moist soil and under cool and humid conditions. They require partial shade and grow exceedingly well in the hills but in the plains they are not successful. In the northern plains they can be grown to some extent with great care. The species *C. pinnata* with pale yellow flowers, however, grows well in the northern plains.

The seeds can be sown in June-July in a glass-house or under protection in a glazed verandah in the hills where the flowering takes place during the summer months. Sowing may also be done in February-March for planting out in pots. In the northern plains the seeds may be sown in September-October. The seeds are very small and hence these should be sown mixed with fine sand and covered lightly with sand or leaf-mould. The seed-pans should be carefully watered, preferably by watering from bottom by half submerging the seed-pans in a basin of water till the top soil becomes wet. The shrubby species can also be propagated from stem-cuttings.

POT MARIGOLD

Calendula officinalis

FAMILY: Compositae *ORIGIN:* South Europe

It is popularly known as Pot Marigold because in England its petals were used in the early days for flavouring soups. They were also used for their medicinal properties.

The plants are medium-tall, about 30-60 cm high, with long,coarse, hairy and slightly sticky leaves. The large flowers which are about 10 cm across borne on long stalks are flat, usually double, of deep orange, canary yellow, dark yellow, apricot and orange-red. The double flowered popular varieties are Ball (light yellow and orange), Campfire (large, bright orange with a red sheen, extra double), Chrysantha or Sunshine (canary yellow), Dania (large, deep orange), Golden Emperor (dark yellow), Goldfink (orange), Grandiflora (dark orange), Orange King (dark orange), Orange Sun (orange-red), Pacific Beauty—Apricot, Cream, Lemon, Flame and Persimmon Beauty, Radio (dark orange, extra double), Shaggy (deep orange), Yellow Colossal (light yellow), Radar (bright orange, quilled petals, extra large), Art Shades (soft pastel shades) and Indian Maid (pale orange with a dark maroon centre). The variety Nova has single gerbera-like flowers which are of orange colour with dark chocolate centres.

In the new variety Zvolanek's Crested Mixed, the flowers are unique with a single row of petals and a crested centre of tiny tubes or quills, many of which are dark-tipped.

Calendula is useful for bedding and cutting. It is also grown in pots and window-boxes. The plants grow well in a moist and well-drained soil. They require full sunshine. The plants should be pinched back to make them bushy and thus made to produce more flowers.

The seeds are sown in September-October or earlier in June-July in those areas which have a low rainfall. The flowers are produced after 2½ to 3 months of sowing. In the hills they can be sown during autumn (August-October) or in February-March. Usually, the seedlings are transplanted but sometimes seeds can also be sown directly in places where the plants are to flower.

CHINA ASTER ,

Callistephus chinensis

FAMILY: Compositae *ORIGIN:* China and Japan

China Aster since its introduction into Europe in the early eighteenth century has undergone remarkable changes. The plants range in height from dwarf (1 cm) to tall (90 cm) with small button-like pompons to large flower-heads which may be single or double, incurved, anemone-flowered, paeony flowered, quilled, ruffled or shaggy. The range of flower colours is very wide and it includes white, rose, pink, blue, lavender, magenta, crimson, scarlet, mauve, yellow and primrose. There are also wilt-resistant varieties.

The dwarf varieties include the Dwarf Chrysanthemum flowered, Dwarf Kirkwell (wilt-resistant), Dwarf Queen and Dwarf Triumph. The tall or medium-tall varieties are Ambria (wilt-resistant), American Branching (wilt-resistant), Beauty or American Beauty, Daisy flowering (Bellona and Cryriaksburg improved red), Duchess, Early Wonder (wilt-resistant), Bouquet or Powderpuff (wilt-resistant), Giant of California, Giant Comet (wilt-resistant), Giant Rocket (wilt-resistant), Heart of France (wilt-resistant), Laplata (wilt-resistant). Lilliput, Ostrich Plume, Ostrich Feather or Crego (wilt-resistant), Curlilocks (extra early Ostrich Plume, wilt-resistant), Pompon, Princess or Super Princess (Berit, Bonnie, Golden Sheef, Goldilocks, Kristina, Lena, Mini, Tanja, Victoria, wilt-resistant), Princess Improved Elite (Edelstein, Marsha, wilt-resistant), Queen of the Market (wilt-resistant), Roment (wilt-resistant), Rose flowered, Rosebud, Rosett, Burpeeana, Early, (wilt-resistant), Stardust (wilt-resistant), Unicum, Unicum Record (wilt-resistant) and Single or Single Sinensis (Helene, Helvetia, Mette, Nero, Nina, Rosabella, Salome, Scarlet King, Sophie, Rainbow and Victoria de Geneve). The new varieties include the Early Bird, Ideal Asters, Blue Wonder Aster and the Cactus-flowered Asters.

The China Aster is excellent for cut flowers. It is grown for bedding and potting. It may also be grown in window-boxes, especially the Pompon, Lilliput and other dwarf varieties and in annual and mixed borders.

The seeds can be sown from August to October and even earlier in June-July in areas having a low rainfall. In Delhi and adjoining areas, the earlier sowing during July to September is useful for obtaining better blooms. In late sowings the flowers are affected by the high temperatures of March-April. It may be sown during March-April or in autumn (August to October) in the hills. Seedlings are transplanted at the four-leaf stage.

The plants require a rich and well-drained soil. They grow best in a sunny situation. Application of liquid manure once a fortnight after the appearance of flower-buds is beneficial. The early varieties bloom within 3½ to 4 months from the date of sowing, while the late varieties take a longer time. The faded flowers should be removed frequently to encourage more flowering.

CANTERBURY BELL

Campanula medium

FAMILY: Companulaceae *ORIGIN:* Southern Europe

It is a biennial plant, about 60-90 cm tall, with long leaves radiating from the base. The flowers are bell-shaped, white, blue, pink, violet-blue or mauve. The flowers may be single or double. The double flowers are cup-and-saucer shaped, while the singles are saucer-shaped. The variety *Calycanthema* has cup-and-saucer shaped flowers. There are also annual varieties of the Canterbury Bells. The species *C. remosissima*

(C. loreyi), a native of Greece, is an annual, about 20-45 cm tall, with saucer-shaped flowers, about 2.5 cm across, of violet colour changing to white at the base.

The other biennial species is *C. pyramidalis,* popularly known as the Chimney bell flower, which is about 1.20 m tall with saucer-shaped pale blue flowers about 2.5 cm across. The Peach-leaved Campanula, *C. persicifolia,* and *C. carpatica* are important perennial species; the latter is dwarf (15-30 cm) and is suitable for growing in rock gardens and for edgings. Another dwarf species is *C. speculum,* now called *Specularia speculum (Campanulaceae),* which is popularly known as Venus's-Looking-glass. It is an annual, 25-30 cm tall, with small violet blue or white flowers. It is also ideal for edging, annual borders and rock gardens.

The Canterbury Bell thrives best in the hills. However, the annual and biennial species perform well in the northern plains. It is useful for growing in annual and mixed borders and for pots. The flowers are also used for cutting.

The seeds are sown in nursery-beds in September-October in the plains. An earlier sowing in July-August can be done in those areas which have a low rainfall. The plant takes about six months to flower after sowing. In the hills, it is sown in March-April or during autumn (August-October). The plants require a moist and well-drained soil. They can be grown in partial shade.

COCKSCOMB

Celosia argentea (C. plumosa)

FAMILY: Amaranthaceae *ORIGIN:* Tropical Asia

It produces attractive long silky feathery flower-spikes (plume-like) in various colours like red, crimson, orange-scarlet, yellow, golden-yellow and silvery white. There are tall-growing (75-90 cm) varieties like Flaming Fire (bright orange-scarlet), Golden Fleece (golden yellow), Pride of Castle Gould (yellow, scarlet, crimson and orange-red), Forest Fire (rich orange-scarlet), Pampas Plume and Thompsonii Magnifica (several bright colours). The dwarf varieties (30-45 cm) are Fiery Feather (bright red), Golden Feather (golden-yellow) Silver Feather (silvery-white), Orange Feather (orange-scarlet) and Lilliput (mixture of bright colours).

The variety Cristata *(C. argentea* var. *cristata)* produces large crested flower-heads resembling a rooster's comb. The flower colours may be deep velvety crimson-purple, bright cardinal red, bright red or scarlet, orange-scarlet, rose, yellow, golden yellow, orange or white. The varieties may be tall about 90 cm high or dwarf or nana, about 25-50 cm tall. The flower-heads may be about 15-20 cm, across. The popular tall-growing varieties are Toreador (45 cm, bright red-scarlet), Royal Velvet (rich ruby-red) and Gilbert Celosia (various bright colours such as yellow, crimson, pink and rose-pink). The dwarf varieties are Empress (crimson), Kardinal (light scarlet), Glasgow Prize (crimson), Golden King (golden yellow), Lilliput, Jewel Box, Chanticleer and President Thiers (various bright colours).

The Cockscomb is suitable for growing along the garden path or hedge and in beds of mixed and annual borders or in pots. It can also be grouped among the shrubs to brighten early foundation planting. It is also excellent for cut flowers and the flowers when dried can last and retain their colour remarkably well for a long time.

Its fine black-coloured seeds may be sown in May-June for growing in the rainy season or even earlier in January-February for planting in the summer season. The seedlings are transplanted when 4 to 6 leaves have developed on them. It requires a well-drained soil as well as a sunny situation. It responds favourably to the application of liquid manure. In the hills it can be sown from February to April. The plants flower after 2½ to 3 months of sowing depending upon the variety, the dwarf varieties flowering earlier than the tall ones. The plants are often attacked by diseases like rust, virus and rot and insects like caterpillars and grubs as a result of which the flower-heads rot and get deformed. In spite of these difficulties, it is rewarding to grow the spectacular and gorgeously-coloured Cockscomb.

CORNFLOWER

Centaurea cyanus

Other common names: Batchelor's Button, Ragged-Robin

FAMILY: Compositae *ORIGIN:* Europe and the British Isles

From the original wild cornflower, a common weed in Europe and the British Isles with bright blue flowers, several garden varieties have arisen through natural variations or sporting. There are now varieties having pink, rose, maroon, purple and white flowers and also some with double flowers. The plants are tall, about 60-90 cm high, with long narrow leaves. There are also dwarf varieties, about 30 cm high.

Of the many varieties of cornflower, the important ones are Emperor William (blue and mixed colours with single flowers), while the double flowered ones are Blue Boy, Pinkie, Red Boy and Snowman. The dwarf (30 cm) Jubilee Gem has large double dark blue flowers. There is also a dwarf variety with pink flowers. The dwarf variety Polka Dot having flowers of various attractive colours is also popular.

The cornflower is commonly used as a cut flower. It can be grown as a background in annual and mixed borders. Since the lower leaves on the plant are generally unsightly, it is better to have candytuft or sweet alyssum as an edging. The dwarf varieties are ideally suited for growing in rock gardens and for edging.

The seeds are sown in September-October. Sowing can also be done earlier in June-July in those regions which have a low rainfall. In the hills seeds are sown during March-April and August-October. The seedlings are later transplanted into beds. Sometimes seeds are also sown directly in permanent beds. The flowering takes place within 3 to 3½ months after sowing. The faded flowers should be removed frequently to prolong flowering.

SWEET SULTAN

Centaurea moschata

FAMILY: Compositae *ORIGIN:* Eastern Mediterranean

Sweet Sultan is tall growing (90 cm), with toothed leaves and fragrant flowers of white, bright red, mauve, violet-pink, reddish-violet, purple and yellow. The yellow-flowered variety produces smaller-sized flowers. The flowers are borne on long stems.

The Imperialis or Giant varieties which are of hybrid origin include Alba (white), Favourita (bright red), Graciosa (violet-pink) and Splendens (reddish-violet). The variety Suaveolens produces yellow flowers. The Odorata has fragrant flowers.

The flowers of Sweet Sultan are excellent for cutting and are ideal for bouquets, especially the white flowers. The plant makes an attractive foil to dwarf flowering plants like candytuft or cynoglossum. Since it lacks body and substance, it is not suitable for bedding alone.

The seeds are sown either in nursery beds for transplanting seedlings later or *in situ.* The sowing is done during September-October in the plains and during March-April or August-October in the hills. The plants flower after about 3 to 3½ months of sowing.

There is another species, *C. americana,* which is about 90 cm tall and produces large thistle-like blooms that are about 10.2 cm across and of a lilac-blue colour. It is a very decorative flower suitable for cutting. It can be grown in the same way as the Sweet Sultan.

WALLFLOWER

Cheiranthes cheiri

FAMILY: Cruciferae *ORIGIN:* Europe

The wallflower is medium-tall (30-45 cm), with thin long grey-green leaves. The flowers are small, sweetly-scented, borne in spikes which may be as long as 45 cm. The colour of flowers may be orange, brown, dark brown, golden orange, scarlet, wine, dark blood red, bronze, cream, yellow, crimson, pink, ruby, primrose purple and flame-red.

Most of the varieties are biennials such as Giant Fire King (flame-red), Cloth of Gold (yellow), Dresden Forcing (dark brown), Fire King (brilliant orange), Giant Brown (dark brown), Golden Bedder (golden yellow), Goliath Forcing (dark brown, large), Hamlet (golden orange), Othello (black red), Paris (yellow brown, earliest), Scarlet Emperor (scarlet) and Vulcan (dark blood red). There is also a dwarf variety Tom Thumb (dark brown) and a smaller-flowered one, Purple Queen (purple). Besides these, a few like Dwarf Branching and Tall Branching have double flowers.

Among the early-flowering annual varieties, the important ones are the Persian Wallflowers, Early Wonder, Early-flowering Phoenix and Early-flowering Yellow Phoenix.

The wallflower is suitable for bedding and cutting. The dwarf variety Tom Thumb is ideal for growing in window-boxes.

The biennial varieties perform best in the hills or in places like Delhi having long cool winters. In the plains the annual varieties grow better than the biennials as they are earlier in flowering. The biennial varieties may flower after about 6 to 8 months of sowing, while the annual ones bloom within 3 to 3½ months.

The seeds are sown in nursery beds in September-October in the plains and in February-March or during autumn (August-October) in the hills. The plants require a well-manured and well-drained soil and a sunny situation.

Another species, *C. x allionii (Erysimum asperum)*, the Siberian Wallflower, is a biennial producing trusses of bright orange-coloured flowers in abundance during winter or early spring. It thrives well in Delhi and the adjoining areas having long and cool winters. It can also be sown in September-October, while in the hills it may be sown in August-September.

ANNUAL CHRYSANTHEMUM

Chrysanthemum

FAMILY: Compositae

The three most popular annual chrysanthemums are *Chrysanthemum segetum* (Corn marigold), *C. coronarium* (Crown Daisy) and *C. carinatum* (Tricoloured chrysanthemum).

The Corn Marigold *(C. segetum)* is a native of Europe and England. The plant is about 30-60 cm high and well branched. The flowers are about 5 cm across and yellow and white in different shades. In some varieties, the flower has a chocolate-coloured centre and light yellow petals. The important varieties are Morning Star, Evening Star, Eastern Star (pale yellow with a chocolate centre), Blanca (white), Eldorado (canary yellow) and Gloria (sulphur yellow). There are also double-flowered varieties like Isabel (white), Romeo (golden yellow) and Yellowstone (sulphur yellow).

The Crown Daisy or the Garland Chrysanthemum (Ch C. *coronarium),* a native of Southern Europe, is a branching annual, about 60-90 cm tall, with very finely-cut foliage and single or double yellow, cream and white flowers, about 2.5-3.5 cm across, with a cream zone at the centre. The popular varieties are Nivea (white) and Orion (yellow) with single flowers and Albo (white), Golden Crown (light yellow), Luteum (yellow), Tom Thumb–Golden Gem (golden yellow), and Tom Thumb–Primrose Gem (cream with a dark centre) with double flowers. There is also a tetraploid variety with larger-sized single pure yellow flowers which is known as Tetra Comet.

The tricoloured chrysanthemum *(C. carinatum)* is undoubtedly the best annual chrysanthemum. It is a native of Morocco. The plants are about 60 cm tall with deeply cut leaves and attractive large (6.5 cm across) flowers having a brightly-coloured ring or zone at the base of the petals and a dark-coloured disc or centre. There may be combinations of white, yellow, red, orange, purple, crimson, scarlet, rose, mahogany or bronze. These flowers produce a triple ring effect. The commonly grown varieties are Merry (mixed colours), Atrococcineum (fiery scarlet), Burridgeanum (white with rose), Eclipse or Chameleon (cream), Flammenspiel

Plate 1—Arctotis (*See page* 37)

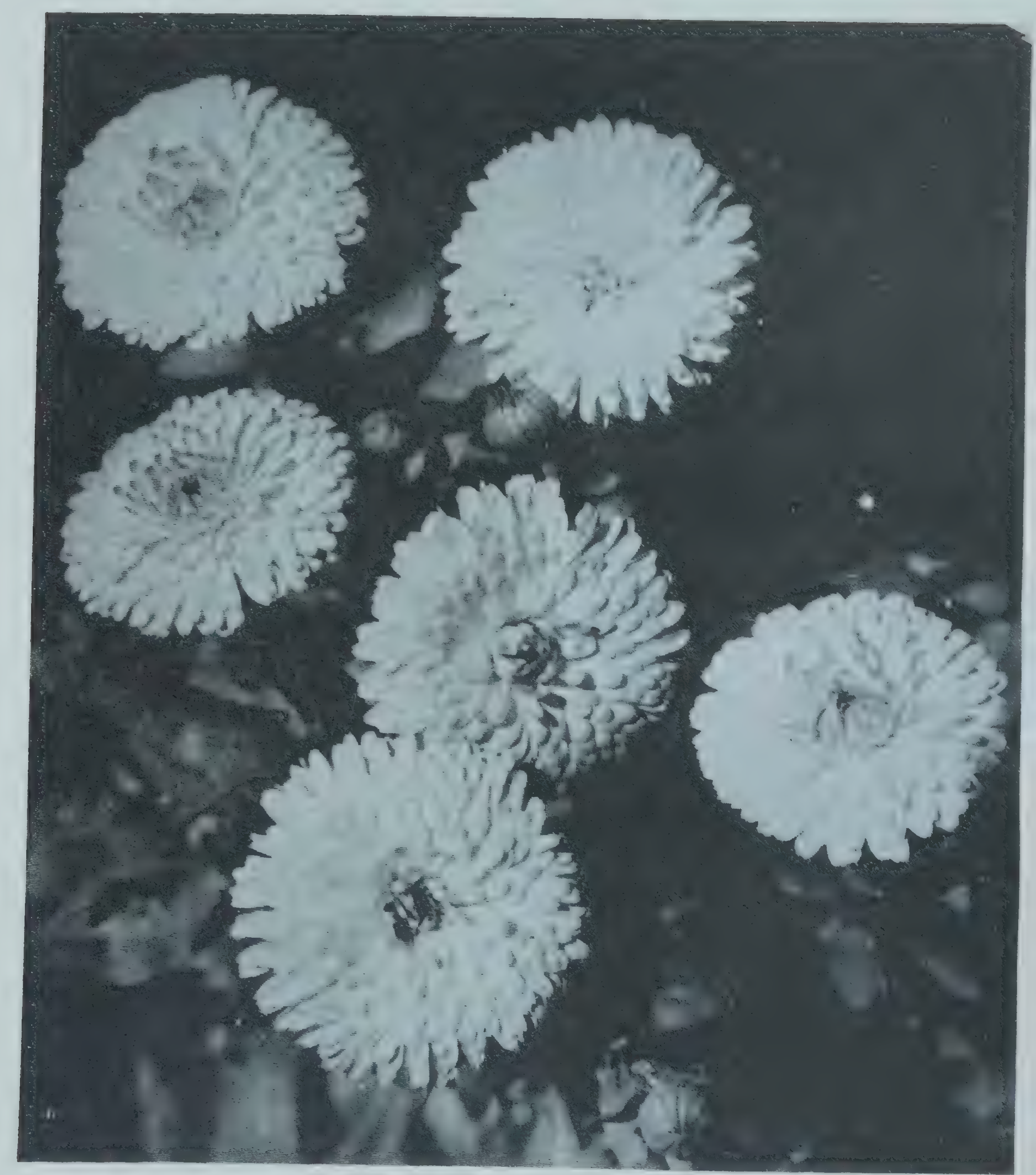


Plate 2—Calendula

(*See page* 43)

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Plate 3—Dimorphotheca *(See page 77)*

Plate 4—Clarkia (*See page* 54)

(mahogany with bronze and yellow), John Bright (yellow with dark eye), Northern Star (white with black centre, large) and Snow-White (pure white). There are also varieties with double flowers. A double-flowered variety of annual chrysanthemum has been evolved at the Indian Agricultural Research Institute, New Delhi, by induced mutation using X-rays.

A few new hybrids *(C. x spectabilis)* produced from the crosses between *C. carinatum* and *C. coronarium* have also been introduced. These are tall (90-120 cm), very vigorous and branched and free flowering with single or double flowers of various shades of yellow, primrose and white.

The annual chrysanthemums have a long flowering period. They are useful for growing in beds, pots and annual and mixed borders. Their cut flowers are excellent for flower arrangements.

The plants can be grown in any kind of soil but require a sunny situation for best performance. The seeds are sown in September-October or during June-July for growing in the rainy season in those areas which have a low rainfall and a cool climate. In the hills, the sowing can be done in March-April. Usually, the seedlings are transplanted after about a month of sowing but sometimes seeds can also be sown directly *in situ* and seedlings thinned out after germination. The plants flower in about three months of sowing.

CLARKIA
Clarkia elegans

Other common name: Mountain Garland

FAMILY: Onagraceae *ORIGIN:* California (U.S.A.)

Clarkia is a tall, erect and branching annual, 60-90 cm high, with slender ascending stems and oval leaves having small

(1.5 cm across) flowers borne in the axils of leaves. The flowers are single or double with ruffled petals and their colour may be salmon, pink, mauve, lilac, rose, carmine, purple, red, salmon-scarlet, fiery scarlet or white. The flowers resemble those of the flowering almond.

The double-flowered varieties which are more commonly grown are Alba (white), Apple Blossom, Brilliant (salmon scarlet), Chamois, Enchantress (light salmon rose), Fire Brand Glorious (carmine scarlet), Lilac, Lady Satin Rose, Royal Bouquet, Salmon Queen (salmon rose), Salmon Bouquet and Scarlet Queen (fiery scarlet). There is also a tetraploid variety, Brilliant Rose.

Clarkia is ideal for grouping in clumps, borders, bedding and cutting. It is also grown in pots. The cut spikes should be immediately placed in water. The dainty flower-buds on the cut spike open later when kept in water.

It prefers semi-shade, a well-manured soil and a dry situation. The seeds are sown directly at the permanent sites and seedlings thinned out later, keeping them about 25 cm apart. However, the seedlings can withstand transplanting if done carefully. The best time for sowing is September-October in the plains and March-April or August-October in the hills. The flowering commences in about 6 to 8 weeks after sowing, particularly in the early flowering varieties. In the plains it flowers during February-March, while in the hills the plants flower during July-October; the autumn-sown plants flower during May-July and the spring-grown during June-July.

Another species not so commonly grown is *C. pulchella,* which is dwarf (30-45 cm), more bushy with single or semi-double flowers of lilac, pink or white colours having toothed and claw-shaped petals. It flowers for a longer period.

SPIDER PLANT

Cleome spinosa

FAMILY: *Capparidaceae* *ORIGIN:* Southern States of America

The plants are tall, 90-120 cm high, with erect branches and sharp spines on the whole plant, including the leaves. The flowers, which are borne in large trusses at the terminal ends of stems have four petals and long, prominent and protruding stamens resembling a spider. The flowers are attractive and strongly scented with an uncommon odour. The colour of flowers may be pink, rose or light purple and white.

The commonly grown varieties are the Pink Queen (or Rose Queen) and Helen Campbell (white); the latter is a white variety of the Pink Queen.

It may be grown in beds, borders and backgrounds. Sometimes it is also used as a temporary hedge. In the plains of northern India, seeds are sown in January-February for summer flowering or in June-July for blooming in the rainy season. Seeds can be sown in March-April in the hills to flower during May-June until late fall. It flowers for a long period. The plants flower in about three months after sowing. The seedlings are transplanted about 45-60 cm apart.

The plants thrive best in a sunny situation and a rich and well-cultivated soil.

PARROT'S BILL

Clianthus dampieri

Other common name: Lobster's Claw

FAMILY: Leguminosae *ORIGIN:* Australia

This is a very showy winter annual. The plants are 60-75 cm tall with small green leaflets. The flowers are borne in clusters of 4 to 6 blooms on sturdy stems. The blooms are large (7-7.5 cm across), pendulous, resembling a parrot's bill or lobster's claw in shape and dark-scarlet in colour with a black and raised base. These flowers are very unusual in shape and extremely pretty.

It is excellent for growing in pots or large containers. Seeds are large and hard-coated. The seeds should be nicked at the edge with a sharp knife before sowing and are sown directly at the permanent sites where the plants are to flower. The sowing is done in September-October in the northern plains and during March-April in the hills. The plants flower after 3 to 3½ months of sowing. The plants thrive best in a light and well-manured soil and a sunny situation.

FLAME NETTLE

Coleus blumei

Other common name: Coleus

FAMILY: Labiatae *ORIGIN:* The Tropics–Java,Indonesia,
Africa,Australia and India

The plants are about 60-90 cm tall and possess brilliantly coloured leaves which have cut or serrated edges. In some varieties the foliage is deeply scalloped, narrow and succulent with green edging and lavender veins which change from pink to red. The leaves that are vividly coloured may be green, dark green, yellowish-green, bronze, crimson, scarlet, copper, mahogany, chartreuse, maroon, rose, pink, yellow, cream or white. The edges in many are darker in colour and the leaves may be uniformly coloured or blotched with streaks or splashes of contrasting colours. The size of the leaves in different varieties varies from 5 cm to about 15-20 cm.

The varieties include the popular mixtures containing several mixed colours, such as the Rainbow Mixture, Sunset Mixture, Brilliant and Kimono colours. In separate colours there are several varieties like Candidum (green edge on ivory), Pastel Rainbow (pale green on pink), Golden Rainbow (green flecks on gold), Scarlet Rainbow (scarlet and green), Red Velvet, Pink Rainbow (coral pink with a green border), Red Rainbow (mahogany and carmine edged with a contrasting green) and Velvet (blood red, darker overtones). The other varieties are Giant, Monarch and Prize.

Coleus is ideal for growing in pots or in the ground. It is a popular house plant for growing indoors in a sunny situation. It may also be grown in beds and borders or as an edging to taller plants.

The plants are commonly propagated from seeds and terminal stem-cuttings. The seeds are sown at the end of June or July and sowing can be done till September. However, the plants will need protection from frost during winter. They thrive best in summer and the rainy season. In the hills seeds can be sown in February-March.

Its very fine seeds are sown carefully in seed-pans or boxes containing a mixture of one part each of soil and leafmould and half a part sand. The seed-pans should be carefully watered, preferably from bottom by submerging half the pan in a basin of water. After about a month of sowing the seedlings may be transplanted first in small 8-10 cm pots, having a light mixture of one part each of soil and leafmould and later after about a month transferred to bigger pots (20-25 cm) containing a mixture of one part each of soil, leafmould and cowdung manure. The seedlings should be pinched back when they are about 10 cm tall to make them bushy. The terminal stem-cuttings may be taken during March-April or July-August and planted in soil or sand after dipping the ends in a rooting hormone like Seradix. The cuttings root easily in about a fortnight. It is better to sow seeds every year as it provides a large variation in colour and size of leaves and does not require maintenance of plants for a long period. However, one may sometimes like to propagate a few choice plants from cuttings.

The plants require heavy watering and plenty of sunshine but not very bright sunlight. The colour of the foliage becomes bright in sunshine but washes out in strong sunlight and in the shade the colour does not develop fully. It is susceptible to water-logging and therefore the soil must be well drained. Application of liquid manure once a week during the growing period is useful. Replacing the top 2.5 cm of soil from the old pots with a well-rotten cowdung manure once or twice is also beneficial to the plants. As soon as the inconspicuous bluish flower spikes start appearing, they should be removed to encourage better growth of plants. After some time, particularly during winter, the plants become leggy and the colour of the leaves begins to fade. Such plants may be shifted to the verandah or under some shade where they may be kept till the next season when they can be propagated by cuttings, if desired.

TICK-SEED

Coreopsis

Other common name: Calliopsis

FAMILY: Compositae *ORIGIN:* North America

The two commonly grown annual species are *C. tinctoria* and *C. drummondii.* The daisy-like flowers of *C. tinctoria* are yellow and brown or crimson-brown. The two common tall-growing forms of this species are Atrosanguinea having dark-red flowers and Marmorata with yellow and brown flowers which are attractively marbled and striped. The plants are tall (60-90 cm) or dwarf (25-30 cm) with smooth and finely-cut green leaves and wiry stems.

The flowers of *C. drummondii* are large, bright golden yellow with a crimson brown centre. The plants are medium-tall, about 45-60 cm high. A popular tetraploid variety is the Golden Crown having golden yellow flowers with a reddish brown centre.

Two not-so-common species, *C. stillmanni* and *C. maritima* (See Dahlia), having bright lemon-yellow and large golden-yellow flowers, respectively, popularly known as *Leptosyne,* are also worth growing in the garden. Their culture is the same as that of the coreopsis.

The seeds of coreopsis can be sown during January-February, June-July and September-October. In the hills, sowing may be done in March-April or August-October. The seedlings are transplanted into beds after about a month of sowing. In the plains it can be grown during summer, in the rainy season as well as in winter and it flowers almost throughout the year except in severe cold. It prefers a rich soil and a sunny situation.

Coreopsis is suitable for growing in beds, backgrounds and annual and mixed borders as well as for cut flowers. The dwarf varieties are also used for edging. The plants are hardy and are often free from diseases or insect pests.

COSMEA

Cosmos bipinnatus

Other common names: Mexican Aster, Cosmos

FAMILY: Compositae *ORIGIN:* Mexico

The plants are tall (90-120 cm), well-branched and early-flowering with deeply cut feathery foliage and large daisy-like flowers. The flower may be pink, rose, purple, crimson, lavender or white with a tufted yellow centre. The flowers are borne on long wiry stems.

The flowers may be as large as 10-15 cm across, particularly in Early Mammoth Sensation varieties like Pinkie (rose-pink), Purity (white), Dazzler (crimson), Gloria (rose with a deep centre zone) and Pink Sensation and Radiance with large rich pink or deep rose flowers with a crimson zone towards the yellow-eyed centre. There is also a variety from our country, known as the Single Alipur Beauty having rose-pink flowers with a crimson centre. Besides these, there are varieties with double flowers in various colours and a tetraploid variety, Versailles, with rose coloured flowers having a crimson centre. Recently, double-flowered Cosmos varieties have been evolved at the Indian Agricultural Research Institute, New Delhi, by induced mutation using X-rays.

Another species, *C. sulphureus,* with yellow or orange flowers having a protruded yellow and black centre, is also grown in the garden. The plants may be tall or dwarf. The dwarf (45 cm) orange-flowered varieties like Fiesta (orange with yellow stripes), Orange Flare, the semi-double Orange

Ruffle and the double-flowered Mandarin are better than the taller forms. These are also known as Klondyke. They produce smaller flowers with bright green foliage.

Seeds can be sown during January-February, May-June and September-October and seedlings may be transplanted after about a month of sowing. The seeds can also be sown in permanent beds and later the seedlings are thinned out after germination. In the hills sowing can be done in August-October or March-April. The flowering commences after about 2½ to 3 months of sowing. Cosmos does not require heavy manuring as it tends to promote excessive vegetative growth. It thrives best in a sunny or semi-shaded situation.

It is ideal for cut flowers, annual or mixed borders, bedding, background and for grouping in masses among tall shrubs.

THE PIN-CUSHION PLANT

Cotula barbata (Cenia barbata)

FAMILY: Compositae *ORIGIN:* South Africa

This is a low-growing (25 cm), tufted and compact annual with very narrow soft hairy leaves and numerous small yellow globular, button-like flowers. The flower-heads do not have any ray petals.

It is ideal for pots, edging and rock gardens. The seeds are sown in September-October in the plains and in March-April in the hills. The seedlings are transplanted later at permanent sites. The plants require a light and well-drained soil and a sunny situation for a good growth.

CIGAR PLANT

Cuphea ignea (C. platycentra)

FAMILY: Lythraceae *ORIGIN:* Mexico

It is a dwarf (30 cm), compact and bushy annual. The flowers are small (2.5 cm), tubular, bright scarlet with black tips and shaped like a cigar.

Another commonly-grown species is *C. miniata (C. llavea miniata).* It is also dwarf (30 cm) with open scarlet flowers having purple bases and white eyes. It flowers profusely. The Firefly is the most popular variety.

The seeds can be sown in September-October in the plains to flower in February-March and during March-April in the hills to flower in late summer or early autumn (June-September). The plants thrive well in a sunny situation and a well-drained soil. Cuphea is grown in beds or pots.

HOUND'S TONGUE

Cynoglossum amabile

Other common name: Chinese Forget-me-not

FAMILY: Boraginaceae *ORIGIN:* China

It is a hardy biennial, usually treated as an annual. The plants are about 30-60 cm tall and compact with lance-shaped oblong grey-green downy leaves. The tiny, sky-blue flowers are borne freely in dainty clusters. The flowers resemble those of the Forget-me-not and are sweetly scented.

The two popular varieties are the Blue Bird and Firmament (dwarf, indigo blue). There is also a white-flowered variety.

It is ideal for bedding, borders, edging and rock gardens.

It can also be grown under the trees or among the shrubs in shaded or partially-shaded situations. The plants grow successfully along north and east walls.

The seeds are generally sown directly in permanent beds and seedlings thinned out later after germination, keeping a distance of 30 cm between plants. The best time for sowing in the northern plains is during September-October, while in the south it may be sown in the rainy season during May-June. In the hills it can be sown during March-April or in September-October. The plants thrive well in a light and well-drained soil.

LARKSPUR

Delphinium ajacis

FAMILY: Ranunculaceae *ORIGIN:* Southern Europe

The garden varieties of Larkspur belong to two species, *Delphinium ajacis,* the Rocket or Hyacinth-flowered Larkspur and *D. consolida,* the Stock-flowered or Imperial Larkspur.

The plants are tall (90-150 cm), early-flowering and well-branched with deep green, finely-divided feathery leaves and tall, erect, long and strong column-like flower-spikes studded with single or double flowers. The flowers may be blue, purple, mauve-purple, pink, salmon-rose, lilac, carmine-red and white. In the Rocket Larkspur, there is a dwarf-growing (30 cm) form also.

One of the most popular varieties is the Giant Imperial *(C. consolida)* including the varieties Blue Bell (light blue), Blue Spire (dark violet-blue), Lilac Spire (lilac with silvery sheen), Carmine King (bright carmine rose), Dazzler (rich scarlet), Exquisite Rose (pink), Lilac Improved (lilac), Los Angeles (salmon-rose), Miss California (deep salmon-rose), Rosamond (bright rose) and White King (white). The Regal, Steeplechase, Elite, Tall Stock-Flowered and Super Imperial including Flamingo (salmon) and White Swan (white) are the other important varieties available in separate as well as mixed colours.

Larkspur is excellent for cut flowers and for growing in background, borders and in front of a tall fence or hedge.

The seeds are sown directly at the permanent sites and the seedlings thinned out later after germination. The plants are spaced about 20-30 cm apart. The sowing is done in September-October in the plains where it flowers during February-March. In the hills it is done during August-October or March-April. The plants grow successfully in a light and well-drained soil.

Another not-so-common but attractive and worth growing species is *D. paniculatum.* It is an annual species and a native of the Balkans. The plants are dwarf (30-45 cm) and well-branched with finely-cut fern-like foliage and bear freely small-spurred violet-blue flowers in masses on thin branches. The other species, *D. grandiflorum (D. sinense),* the Chinese Delphinium, is also commonly grown in the garden. It is a perennial but treated as an annual. It is a dwarf (30 cm) species with large single blue and white flowers. Its common varieties are the Blue Butterfly, Blue Mirror and Dwarf Gentian Blue; the last species is ideal for edging, rock gardens, pots and window-boxes.

PERENNIAL DELPHINIUM

Delphinium hybridum

FAMILY: Ranunculaceae

Most of the modern perennial Delphiniums have been evolved from crosses made between *D. elatum* and other species like *D. formosum, D. cardinale, D. belladonas, D. nudicaule,* etc. The perennial Delphinium thrives-best in the hills but it can be grown as an annual but not as a perennial in northern plains like Delhi and neighbouring areas which have a sufficiently cool winter. Since the Delphinium can be grown as an annual in the northern plains, it may be worthwhile to describe it.

The perennial Delphinium, *D. hybridum,* is tall (1.5-2.0 m) and branched with lobed and divided leaves and tall and stout flower spikes having spurred flowers of blue (pale to deep blue), white, purple, violet, lavender, lilac and mauve colours. Recently, new colours like red, scarlet, orange and yellow have also been added to Delphiniums, particularly in the University Hybrids evolved by Dr. Legro in Holland. The flowers may be single or double. In many modern varieties the flowers are double and large, exceeding in size those in the annual Delphinium or Larkspur. The varieties of *D. elatum* are most used in the gardens. There are several other species also. The dwarf and branching *D. belladonna* having blue florets, the tall *D. cardinale* and *D. nudicaule* with scarlet flowers, *D. ruysii* 'Pink Sensation' having pink flowers and *D. grandiflorum (D. chinense),* the Chinese Delphinium, a bushy and free-flowering species with blue flowers, are a few important species of Delphinium grown in gardens.

The Pacific Giant varieties like Astolat (pink and lilac), Black Knight (dark blue with a dark eye), Blue Bird (blue with a white eye), Blue Jay (medium to dark blue), Cameliard (lavender), Galahad (white large), Guinevere (lavender rose with a white eye), King Arthur (dark purple with a white eye), Lancelot (lilac), Percival (white with a black eye), Round Table (mixed colours) and Summer Skies (light blue) are most popular. The Connecticut Yankee is the latest variety which is 75 cm tall with large spikes and 6.5 cm across florets of mixed colours. The Belladonna, *D. belladonna* (turquoise-blue) and

Bellamosum (*D. bellamostum,* dark blue), Sapphire, *D. formosum* (medium blue with a golden eye), Wrexham or Hollyhock-flowered (shades of blue), Floradale Giants, Blackmore and Langdon's Hybrids from England and University Hybrids (including new colours—red, orange, pink and yellow) from Holland are other important garden Delphiniums. The Belladonna varieties, Blue Bees (skyblue), Isis (deep blue), Semiplena (light blue, semi-double), Thesdora (blue) and Wendy (gentian blue) are well known. Among the tall varieties of the Chinese Delphinium, Cambridge Blue (azure blue), Liberty (dark blue) and White and in the dwarf-growing, Azure Fairy (sky-blue), Blue Butterfly (dark blue), Blue Mirror (navy blue, spurless flowers), Tom Thumb (dark blue) and Dwarf Gentian Blue are commonly grown.

Delphinium is ideal for cut flowers, mixed or annual borders and backgrounds. The dwarf Chinese Delphinium can be used for pots, window-boxes and rock gardens.

The Delphinium is propagated from seeds, cuttings or division. The pale blue and dark blue varieties breed true from seeds. In the hills the seeds are sown in February-March under heat to raise early seedlings to make them flower in August-September. Sometimes the sowing can be done in August-September to obtain early flowering during summer. In the northern plains the seeds are sown during late September or early October and the plants flower late during March-April. Since in the plains the Delphinium flowers late, its flowering is badly affected by hot weather. The seeds take a long time (several weeks) to germinate. The plants can be multiplied from division and cuttings during July-September but vegetative propagation is possible only in the hills where Delphinium can be grown as a perennial. The plants require a deep, well-drained soil and sunny or semi-shaded situations for good growth.

SWEET WILLIAM

Dianthus barbatus

FAMILY: Caryophyllaceae *ORIGIN:* Northern France

Sweet William *(Dianthus barbatus)*, which is closely related to carnations and pinks, is a biennial but there is also an annual strain. Some of the compact, dwarf and early-flowering biennial varieties can be grown as annuals. The plants are medium-tall, about 30-45 cm high, with broad, flat and pointed rich green foliage and single or double delightfully fragrant flowers borne in large rounded and showy clusters at the terminal ends of stems. The flowers are of various pleasing colours such as scarlet, purple, salmon, dark red, pink, crimson, salmon-pink, rose-pink, dark maroon and white. The flowers may be self-coloured, zoned, edged, starred, mottled or with clear white eyes.

The annual dwarf variety (15-20 cm), Wee Willie, with a combination of crimson, rose-pink, ruby and white self-coloured, zoned and edged flowers, is most commonly grown in the garden. The popular biennial varieties are Albus (white), Astrosanguineus (dark purple), Copper Red (bright copper), Crimson Beauty (crimson with white centre), Diadem (scarlet with white eye), Nigrescens (black red), Oculatus Marginatus (white with a dark red ring), Black Beauty (deep maroon), Giant White (large white), Newport Pink (salmon-pink), Pink Beauty (rose-pink), Scarlet Beauty (rich scarlet), Roseus Splendens (cherry pink), Holborn Glory (auricula-eyed, mixed colours), Tall Single and Tall Double. The dwarf and compact Indian Carpet with single flowers of mixed colours and the Dwarf Compact Double Mixed with double flowers are the common dwarf biennial Sweet William varieties.

Sweet William is excellent for cut flowers, borders and beds. The dwarf varieties are suitable for edgings, rock gardens, pots and window-boxes.

The seeds are sown in nursery beds or seed-pans in September-October and the seedlings transplanted into beds after about a month of sowing to obtain flowers during January to March. The plants flower in about 3 to 3½ months after sowing in the annual varieties and in about 6 to 8 months in the biennial varieties. In the hills, the seeds are sown in August-October and the plants flower during spring or early summer. When sown in February-March, it flowers in late summer or July-September in the hills. While the annual varieties do well almost everywhere in India, the biennials grow best only in the hills and in those areas like the northern plains where there is a cool winter.

The plants require a rich and well-manured soil and a sunny situation for good growth.

CARNATION

Dianthus caryophyllus

FAMILY: Caryophyllaceae *ORIGIN:* Southern France

The ancestral species of carnation are natives of central and southern Europe. Its botanical name *Dianthus* is a Greek derivative meaning a divine flower. It has a long history of cultivation. According to Theophratus, it was grown in the ancient gardens of Greece as early as 300 B.C. While in France in the early days it was used for medicinal purposes, the Mohammedans prepared scent from carnations. It was also known to Shakespeare in England and was popular in America as well.

The plants are medium-tall, about 45-90 cm high, with long, narrow and thick grass-like smooth leaves, grey-green

Plate 5—Clianthus

(*See page* 56)

Plate 6—Coreopsis

(*See page* 59)

Plate 7—Acroclinium (*See page* 92)

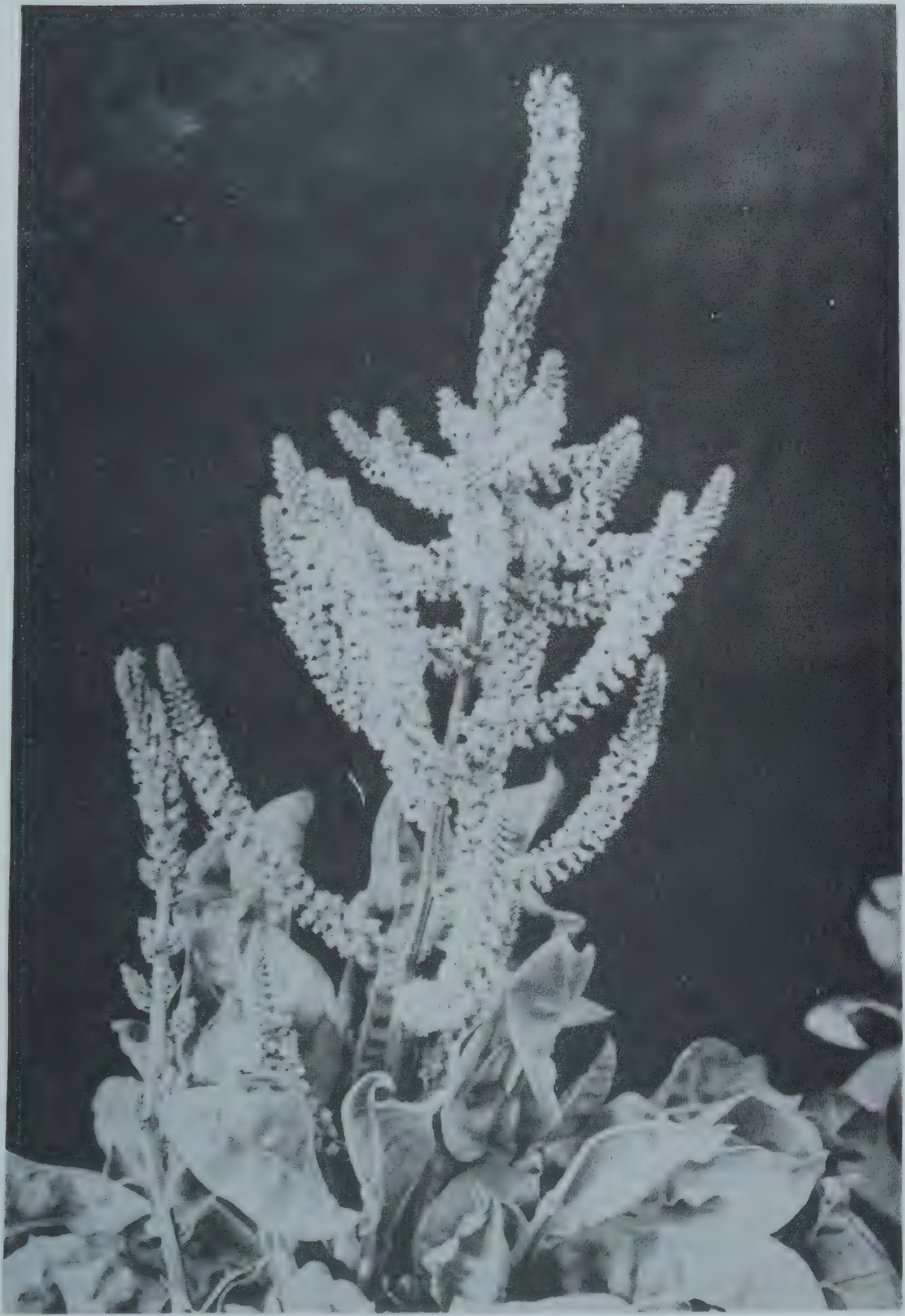

Plate 8—Statice—*Limonium Suworowii* (*See page* 100)

Plate 9—Lupin—Annual (*See page* 105)

Plate I—Antirrhinum (*See page* 35)

Plate II—Carnation (*See page* 68)

stems and swollen nodes. The flowers that are borne on the terminal ends of the stems may be single or double with fringed or smooth-edged petals, sweet clove-like fragrance and of various colours like cream, yellow, red, rose, salmon, pink, purple, maroon, scarlet, crimson, rosy-lilac, salmon-rose, orange, buff, lavender, cherry, apricot and white. The flowers may be self-striped, flaked or combinations of various fancy colours.

The three main types of garden carnations are the Border carnations, Perpetual-Flowering and Marguerite or Chabaud. The Border-carnations have symmetrical and well-frilled flowers with broad and smooth-edged petals but not crowded centres in flowers. These include Selfs with a single even colour, Fancies having irregular markings or the blended colours, Picotees with a broad or narrow, round rich-coloured band round the edge of the petal on a background of white, yellow and buff, Flakes with radial stripes or wedge-shaped markings of one colour and Bizarres which are like Flakes but with markings of more than one colour. The carnations grown in the early days were mostly the Borders which had most perfectly-formed and attractively-coloured flowers. In the first year the border carnation plants have a single stem but later in the second year of growth, they become bushy.

The Perpetual-flowering carnations comprising the American Tree carnations and the Perpetual Malmaisons originated in America as seedlings from the well-known introduced Remontant of France which is still grown in the Riviera. They are hybrids involving several species of *Dianthus*. During the middle of the nineteenth century in the U.S.A. when the Scotsman Peter Fisher sold the first Perpetual-Flowering variety to the copper king, T.W. Lawson, for about 30,000 dollars which was named after him, it created a sensation all over the world and became a popular variety. The Perpetual-Flowering produces longer and more branching stems than the border carnation. The flowers, which are produced at the end of each stem, have petals with fringed edges. In some varieties the petals are only slightly frilled. The flowers of the Perpetual-Flowering travel better and hence are preferred by florists. The flowers are usually self-coloured but there are varieties with markings on petals. In foreign countries where the winter is severe, the Perpetual-Flowering carnations are grown in a glass-house but in our country they can be grown outdoors in the northern plains where the winter is mild. However, in the hills it is best grown in a glass-house. For cut flowers Sims carnations are the best varieties. These are Scania Red, Arthur Sim, William Sim, Picottee and Shocking Pink. Spray types like Orange Elf, Peachy, Goldilocks, Exquisite and Maj. Brittle are also some of the popular varieties for cut flowers.

The Marguerite carnations are also perennials of the perpetual class but are treated as annuals. The flowers are large and have fringed petals but they do not last long when cut. The flowers are produced freely over a long period. In the Chabaud variety the flower petals are heavily frilled, while those in the Enfant de Nice are slightly frilled. The Marguerite, Malmaison, Chabaud, Riviera, Giants and Enfant de Nice are the varieties which can be grown as annuals.

The important varieties of Border carnation are Madonna (white), Snow Clove (white), King Cup (yellow), Consul (flame-apricot), Crimson Model (crimson), Perfect Clove (glowing crimson), Royal Mail (scarlet), Fiery Cross (scarlet), Pink Model (salmon-pink), Frances Sellars (rose-pink), Lavender Clove (lavender-grey), Picotee Fascination (ivory-white with thin purple edge), Apricot Bizarre (apricot marked with carmine and rose), Cherry Flake (cerise marked with maroon) and Scarlet Flake (orange-scarlet marked with chestnut). Among the popular varieties of the Perpetual -Flowering, mention may be made of Allwood's Crimson, Ancient Rose, Canadian Pink and White, Doris Allwood (salmon-rose, fragrant), Golden Rain (yellow), Monty's Pink and Titian (crimson). The commonly grown Chabauds include Aurora (salmon-rose), Entincelant (bright red), Jeanne Dionis (white), Legion d'Honneur (brick red), Marie (yellow), Nero (dark red), Orange Sherbet (orange-apricot striped and suffused scarlet), Pearl (rosy lilac), Princess Alice (rose-edged white), Rosette (pink), Salome (soft pink) and Enfant de Nice (mixed and separate colours). These varieties have black seeds. The other annual varieties are Margaret, Marguerite, Malmaison and Riviera Giants. The perennial varieties are Black King (dark black red), Grenadin (medium-tall, scarlet, rose, yellow and white), Old Rose (pink), Triumph (large, double, pink, red or white) and Vienna Dwarf (early dwarf).

Carnation is excellent for cut flowers, bedding, borders, edgings, rock gardens and pots. The flowers have a delightful spicy clove-like fragrance and last long when cut and used in flower arrangements.

Carnation is propagated from seeds, layering and cuttings. The Marguerite or Chabaud type is best raised from seeds as it usually comes out true from seeds. The Border carnation is propagated from layering and the cuttings usually do not root easily. Stem-tip cuttings taken from the lateral shoots are ideal for propagating the Perpetual -Flowering carnation. The Border and Perpetual Flowering carnations often do not come out true from seeds and hence vegetative propagation is commonly practised. Sims type of carnation are propagated from cuttings. The first cuttings can be taken from lateral shoots in March in northern plains and put in sand for rooting. These rooted plants can provide two to three cuttings until July.

In our country carnations can be grown as perennials in hills only, but also in Delhi and surrounding areas with little care. They are usually treated as annuals in the northern plains where winter is cool and long. The Border carnations thrive better in the hills, while in the plains the Perpetual-

Flowering and Marguerite or Chabaud are more successful. In the northern plains it flowers from January to April and often till May. In the plains the seeds are sown during August-October. In the northern plains it is better to practise early sowing from August to September to avoid damage to flowers from high temperatures. In the hills seeds are sown from August to October or in March-April. The seedlings are transplanted after about a month of sowing. The plants flower after about 4 to 6 months of sowing. Layering and cutting are best done in February-March in the plains and from October to March in the hills. The lateral shoot without any flower bud is selected for layering. Before layering the lower leaves on the selected shoots are removed. A clean cut about half the thickness is made into the stem between two nodes, starting just below the lower joint and ending a little below the upper one to form a 'tongue'. The cut is kept open and the 'tongue' is pressed into the soil and pegged down with a layering pin or a small hair-pin and covered with soil. The terminal end of the shoot is kept above the soil. After about a month when the layers have formed roots, these can be separated and potted individually in 8-10 cm pots containing a mixture of equal parts of soil and sand and half a part leafmould. About 10 cm long cuttings with four leaves are taken from the well-developed side shoots which do not have any flower bud. The leaves at the base are removed before inserting the cutting into sand, taking due care that the leaves do not touch the surface. The cuttings are planted about 5 cm apart. Within about a month when the cuttings develop sufficient roots, put them individually in a 8-10 cm pot and later shift them into 15-cm pots. the potting mixture contains equal parts of soil and leafmould and half a part sand.

The plants thrive best in a well-drained soil, rich in lime (not acidic) and a sunny situation. Deep planting, waterlogging and mulching with organic manures like leafmould and cowdung manure should be avoided to prevent stem rot. Cowdung manure or compost may be applied deep into the soil while preparing the beds. Bonemeal, about 115 gm per square metre, is also applied at the time of preparation of beds for planting. Nitrogenous fertilizers or manures should not be applied in large doses as these tend to produce excessive vegetative growth in the plants and delay the flowering and may also cause diseases and splitting of the calyces in the flowers.

The plants should be staked in early stages of growth to keep the plants upright. Stopping and disbudding are commonly practised. When the plants are about 25-cm tall, snap off about 1.5 cm of the growing point, as stopping encourages the development of side-shoots. About half the lateral growths arising in the leaf axils are also stopped when they are about 15-20 cm long. Stopping delays the flowering and therefore it should be done early. However, in the Border carnations stopping is not practised as it produces only one stem. The secondary flowers borne on the terminal shoots and on the main stem are disbudded until only one bud is left to develop at the top of the main stem and the side-stem. Disbudding encourages long-stalked and larger blooms. In some varieties the calyces of the flowers split due to over-feeding or hereditary character. This can be prevented by tying a string or a rubber band to the calyces before the opening of the flower-buds.

In the hills carnations can be grown as perennials. The plants after flowering should be cut near the base and shifted into pots and kept in shade and under protected conditions during summer (May-June) and winter. During autumn when the plants develop new shoots, they can be multiplied from cuttings or layering. Although the plants can be kept for three to four years, it is better to discard them after two years when their flowering and vigour deteriorate considerably. In the plains it is very difficult to keep plants after flowering as they often die during the hot months or the rainy season. However, by growing plants on ridges and covering them with alkathene during rainy season, one can avoid their mortality to a great extent.

INDIAN PINK

Dianthus chinensis (D. sinensis)

Other common names: Chinese or Japanese Pink

FAMILY: Caryophyllaceae *ORIGIN:* Eastern Asia

The plants are 30-45 cm tall and free blooming with thin and long leaves and brilliantly coloured large delightfully fragrant flowers, about 2.5-7.5 cm across. The flowers may be self-coloured exquisitely marked, edged, blotched, spotted, or eyed with contrasting colours. In some the flowers have finely fringed petals. There are also varieties producing blooms in clusters on upright and strong stems. The flower colours may be pink, rose, scarlet, red, crimson, salmon, orange-scarlet, lilac, violet, maroon black, maroon, mauve, purple or white.

The two most commonly grown varieties are Heddewigii, the Japanese Pink *(D. chinensis heddewigii)* and Lacinatus, the Fringed Pink *(D. chinensis lacinatus).* The Pink introduced from Japan by Carl Heddewigii, a gardner of St. Petersburg (England), and grown in the nineteenth century was named Heddewigii. The plants of this group are dwarf (15-30 cm), compact and free flowering with exquisite and attractively coloured single or double flowers having fringed and showy markings. The Lacinatus group has 30.5 cm tall plants with carnation-like single or double flowers in a wide range of colours having contrasting edges, attractive fancy patterns and finely fringed petals.

The single-flowered Heddewigii varieties include Blue

Peter (blue), Salmon Queen (salmon-pink), Red Bedder (deep red), White Loveliness, Scarlet Queen, Rich Crimson, Cyclops (crimson with a white eye) and a recent introduction Bravo (dazzling scarlet red). The two important double-flowered varieties of Heddewigii are Black Prince (maroon black with a silver edge) and Diadem (pink, rose, crimson and purple grounds with black markings and lace-like white edging). The Brilliant Fringed Mixed, Floradale (mixed), Fireball (scarlet), Laced Pinks (mottled pink on a white ground), Pink Beauty (rose pink), Salmon King (salmon-pink) and Snowdrift (white) are the popular Lacinatus varieties with single and fringed flowers. The varieties having double fringed flowers include Gaiety Mixed, Snowball (white) and Fringed Lacinated Double Mixed. The other commonly grown varieties are the Chinensis Double Mixed with blooms in clusters on upright and strong stems, Dwarf Double Mixed, dwarf (15 cm) compact plants with double flowers and Delight Mixed with single fringed flowers. The two important tetraploid varieties are the Heddensis and Westwood Beauty having large and long-stemmed flowers of the Heddewigii type in various attractive colours.

In the hills the perennial species *plumarius* (Ch varieties Semperflorens with single flowers and Spring Beauty with double flowers), *Allwoodi, winteri* and *deltoides* (Ch varieties Brilliant with dark rose flowers and Erecta with dark red blooms) can be grown successfully. The other Hardy Pinks are the Little Jock Hybrids (dwarf 15-20 cm, compact, fringed pink, rose and white flowers with a deep zone), Double Scotch Pinks (30-35 cm tall, flowers pink, rose-salmon and white, many zoned with bright red and bicoloured, free flowering) and New Rock Hybrids (mixed colours).

The Pinks are excellent for beds, borders, edgings, rock gardens, pots and cut flowers. The Chinensis varieties are specially suitable for borders, Heddewigii for bedding and edging, Lacinatus for rockery and bedding and the Hardy Perennial Pinks for rock gardens and edging.

The seeds are sown in September-October in the northern plains and during the rainy season in areas having a low rainfall (less than 75 cm). The seedlings are transplanted after about a month of sowing. In the hills the seeds can be sown during March-April and also from August to October for early flowering in spring. The plants bloom in about 3 to 3½ months after sowing. The Pinks thrive best in a loam soil, moist and cool conditions and a sunny situation.

FOXGLOVE

Digitalis purpurea

FAMILY: Scrophulariceae *ORIGIN:* Great Britain

Foxglove *(D.purpurea)* is also a medicinal plant cultivated for the production of digitalin. It is a biennial plant but can be treated as an annual. In our country it is grown in the hills.

The plants are about 60-150 cm tall with large, downy, ovate leaves and long tubular slightly drooping flowers open at the mouth and attractively spotted inside and borne on long stout spikes. By natural variation and selection as well as crosses with other European species *(Ch. D. luteum)*, several garden varieties have been evolved. The flower colours include purple, rose, cream, primrose, apricot, crimson and white.

The most important variety is the Excelsior Mixed which has arisen as a bud sport. It is early blooming with tall spikes (1.5-2.0 m) and large flowers borne horizontally all round the stem instead of the usual drooping blooms on three sides only. The spikes are bold and more showy. It is ideal for beds and borders and for growing in clumps. The other varieties like Shirley (extra large bell-shaped flowers), Gloxiniaeflora, Gloxinoides or Gloxinia flowered and Monstrosa are suitable for growing in wild gardens and woodlands for naturalizing. They can also be grown in the shrubbery.

The seeds are sown in February-March and and plants take about a year to flower. The seedlings are transplanted later at the permanent sites. It can withstand transplanting even at the flowering stage. The plants can be grown successfully in a well-drained, rich and moist soil with plenty of humus and in semi-shaded situations.

STAR OF THE VELDT

Dimorphotheca sinuata (D. aurantiaca)

Other common names: African Daisy, Namaqualand Daisy,
Cape Daisy, Cape Marigold

FAMILY: Compositae *ORIGIN:* South Africa

The plants are about 30-60 cm tall with long narrow leaves and glistening daisy-like large single flowers of various vivid colours such as deep orange, white, bluish white, lemon, sulphur-yellow, golden-yellow, salmon, rose, apricot, reddish-purple, salmon-pink and buff. The plants are early and very free-flowering and continue to bloom for a long time. The flowers close at night and in dull weather.

Many of the modern garden varieties, particularly the Aurantiaca Hybrids and Special Hybrids have arisen from crosses between different species, such as *D. sinuata (D. aurantiaca), D. pluvialis, D. ecklonis, D. chrysanthemifolia* and *D. calendulacea.* The popular varieties are the Aurantiaca Hybrids including the varieties Orange Glory, Orange Improved, Salmon Beauty, Buff Beauty and White Beauty. There is also a tetraploid variety Goliath with large orange flowers. The other varieties are the Special Hybrids, Glistening White (large, white with blue disc), *D. pluvialis* 'Ringens' (white suffused with purple or yellow having a broad zone of blue-purple at the base of the petals), and Ecklonis *(D. ecklonis;* with pure white flowers having a bright blue centre or disc).

Dimorphotheca can be grown as low edgings along walks, in beds, borders, pots and rock gardens and for cut flowers. The flowers are used for decoration in the day time as they close at night.

The seeds are sown in September-October and the seedlings transplanted later at permanent sites. In some areas which have a low rainfall, sowing can be done during the rainy season. In the hills it is sown during March-April. The plants flower in about 6 to 8 weeks after sowing. They require a rich, well-drained, well-manured and moist soil and a sunny situation.

VIPER'S BUGLOSS

Echium plantagineum

Other common name: Tower of Jewels

FAMILY: Boraginaceae *ORIGIN:* The Mediterranean Region

Both tall (60-90 cm) and dwarf (24-30 cm) varieties are grown in the garden. The plant is erect, bushy and hairy with long lance-shaped greyish-green leaves with small bell-shaped flowers of various soft pastel colours like blue, purple-blue, violet-blue, rose-pink, purple, mauve and white.

The Bright Blue is a tall-growing (60-90 cm) variety, while the Blue Bedder with deep blue flowers is dwarf (30 cm) and compact. The Bright Pink is similar to the Blue Bedder but produces bright pink flowers.

Echium is suitable for borders, edgings, rock gardens, beds and pots.

The seeds can be sown in January-February, June-July and September-October to grow the plants during summer, the rainy season and winter, respectively. In the hills the sowing is done in March-April. The seeds can be sown either directly at permanent sites or in seed-pans for transplanting seedlings later into beds. The plants thrive well under a wide range of conditions including wet, cold and warm weathers and moist and dry conditions and a poor soil.

TASSEL FLOWER

Emilia flammea (Cacalia coccinea)

Other common name: Flora's Paintbrush

FAMILY: Compositae *ORIGIN:* Tropical America

The plants are 30-45 cm tall. The leaves are long, thin, oval and clasping the hairy stems. The tassel-like, small (1.5 cm across) flower-heads of bright orange-scarlet colour are borne on long wiry stems. There is also a variety (lutea) with golden-yellow flowers.

The seeds can be sown in January-February, June-July or September-October. The plants grow well in almost all weathers. The seedlings are transplanted later into permanent beds. The seeds are sown in March-April in the hills. The plants are early blooming (2½ months after sowing). They grow well in a well-drained and light soil and a sunny situation.

It is excellent for cut flowers and bedding.

CALIFORNIAN POPPY

Eschscholzia californica

FAMILY: Papaveraceae *ORIGIN:* California (U.S.A.)

Although in its natural habitat the Californian Poppy is a perennial, it is grown as an annual in the gardens. The plants are 30-45 cm tall with smooth, blue-green, finely-cut, foliage and slender stems. There are some dwarf (25-30 cm) varieties also. The flowers are large, about 7.5 cm across, saucer-shaped or poppy-like with petals having a satiny sheen. The flowers may be single, double or semi-double. The flower colour may be bright yellow, lemon, orange, cream, bronze, orange-red, crimson, rose-pink, rich orange, creamy-pink, chrome-yellow and creamy-white. In some varieties the flowers may be bicoloured (the outer surface bronze and the inside orange) or with frilled petals. The plants are early and bloom profusely. The flowers close at night and the petals fall off after the flowers fade.

The popular varieties with single flowers are Aurora (creamy-pink), Carmine King (carmine), Chrome Queen, Crocea (orange), Mandarin (dark orange, bronze outside), Mikado (orange-crimson), Red Chief, Flame (coppery orange-scarlet), Yellow, White, Fireglow (brilliant orange), Aurantiaca (yellow), Dazzler (bright scarlet),), Gleaming (coral-pink), Golden West (golden yellow with deep centre), Sunset Mixture and Pot o' Gold Mixture. The Mission Bell varieties including the Carmine Queen, Flambeau and Robert Gardener (dark orange) produce double or semi-double flowers of various colours, while in the variety Monarch Art Shade Mixture the flowers are semi-double.

The Californian Poppy can be grown along walks and in beds, borders, pots and rock gardens. The flowers can be used for cutting when picked in the budding stage and placed immediately in deep cold water. It is a very popular and hardy annual.

The seeds are sown directly at permanent sites and seedlings thinned out later, about 23 cm apart. The sowing can be done in September-October in the plains and from August to October or March-April in the hills. The plants grow successfully in a light and well-drained soil and a sunny situation.

KINGFISHER DAISY

Felicia bergeriana

FAMILY: Compositae *ORIGIN:* South Africa

The plants are low-growing (15-25 cm) and trailing in habit with a rosette of small, round, hairy leaves and short stems. The flowers are small daisy-like and bright metallic-blue in colour with a yellow centre. The flowers close at night or in dull weather.

It is ideal for growing in rock gardens, borders (in front rows) and pots.

The seeds are sown directly in beds or pots where the plants are to flower. The sowing is done in September-October in the plains and during March-April in the hills. The seedlings are thinned out to about 15-25 cm apart. The plants can grow well in a sunny as well as a semi-shaded situation and a light and well-drained soil.

BLANKET FLOWER

Gaillardia pulchella

FAMILY: Compositae *ORIGIN:* America

This is a popular easy-to-grow plant which is medium-tall, 45-60 cm high, with long and oblong leaves. The flowers are daisy-like, long-stemmed, single or double, large, about 5.8 cm across, in many attractive warm colours including some bicolours like yellow, lemon, cream, copper-scarlet, yellow-purple, crimson-purple, orange, copper, maroon and bronze. In some varieties the flowers have bronzy-red florets with yellow central discs or bronzy-red tipped with white or crimson-purple tipped with yellow. The plants are bushy and free-flowering and bloom continuously for a long time.

The two most commonly grown varieties are *picta (G. pulchella picta)* with large single flowers and *lorenziana (G. pulchella lorenziana)* with double fluffier flowers having quilled petals, split-tips and a combination of several attractive colours in a single bloom. Among the varieties of *picta*, the popular ones are the Indian Chief (bronzy-red) and Picta Mixed. The double-flowered varieties are Lorenziana, Sunshine Strain and Gaiety Double Mixed in various colours. There is also the Double Tetra Fiesta, a tetraploid variety with large (7.6 cm across) double flowers with brilliant smoky-red quilled petals tipped with bright yellow. Besides, there are a few perennial varieties, known as the Grandiflora, with large single flowers like Bremen (coppery-scarlet, tipped yellow), Burgundy (coppery-scarlet), Dazzler (golden yellow with a maroon-red centre), Kobold, Goblin (yellow with dark centre), Regalis (red), Monarch Strain (mixed colours) and Sanguinea (blood-red).

It is an excellent flower for beds, borders and cuttings. Its gorgeously-coloured flowers are best arranged in copper bowls or simple plain-coloured vases.

It can be grown over a long period during summer, the rainy season and winter. Seeds can be sown in February or March to obtain flowers during summer. When sown in May-June, it will flower during the rainy season and for flowering in winter the sowing may be done in September-October. In the hills, seeds can be sown in March-April. It withstands drought and hot weather exceedingly well. The seedlings are transplanted after about a month of sowing. For successful cultivation, open and sunny situations and medium-loam soil are necessary. The plants are late-blooming and flowering commences after about 3½ to 4½ months of sowing.

GAZANIA

Gazania splendens

FAMILY: Compositae *ORIGIN:* South Africa

Gazania is low-growing (15-23 cm) with a trailing habit. Its leaves are narrow and long and silvery with woolly hair on the underside. The flowers are large, daisy-like with attractively marked ray petals and polar discs with contrasting zones and often beautifully spotted. The flowers are borne on short stems and almost cover the ground. The flower continues for a long time. The flowers close in the afternoon. The colour of flowers may be of different shades of red, orange,pink, cream, yellow, white or brown which come out true from seeds.

The seeds are sown in September-October in the plains and during March-April in the hills. The usual practice is to sow the seeds directly at permanent sites. The flowering starts after about 3-3½ months of sowing. The plants thrive best in a well-drained soil and a sunny situation. They can also be propagated from cuttings and layering.

Gazania can be grown effectively in rock gardens and in the front row of borders and for low edgings.

The modern garden varieties are hybrids resulting from crosses between different species. The Gazania Hybrids are available in different mixed shades, particularly red and orange and pink and cream.

GILIA

Gilia capitata

FAMILY: Polemoniaceae *ORIGIN:* California (U.S.A.)

The plants are about 45-61 cm tall with very finely-cut foliage. The flowers are small, about 2.5 cm across, and borne in clusters on long (45-61 cm) stems well above the foliage. The flowers are lavender-blue in colour.

There is a low-growing (7.6-15.2 cm) annual species, *G. x hybrida (Leptosiphon hybridus),* with dense clusters of very small flowers of yellow, orange, red, purple, rose and violet colours. Another annual species is *G. tricolor (G. nivalis),* the Bird's Eyes which is 30-45 cm tall with dense heads of small flowers of various colours such as white, lavender, pink and white, with golden and purple centres. The Scarlet Gilia, *G. rubra (G. coronopifolia),* is a tall (90-120 cm) biennial. The scarlet-coloured flowers are formed in plumed spikes.

Gilia can be grown in clumps in the front position in annual borders, in rock gardens and along paths.

The seeds are sown directly at the sites where the plants are to flower. The sowing may be done in September-October in the plains or during March-April in the hills. The plants require a light, moist and well-drained soil and a sunny situation for good growth.

Plate III—Dianthus (*See page* 67)

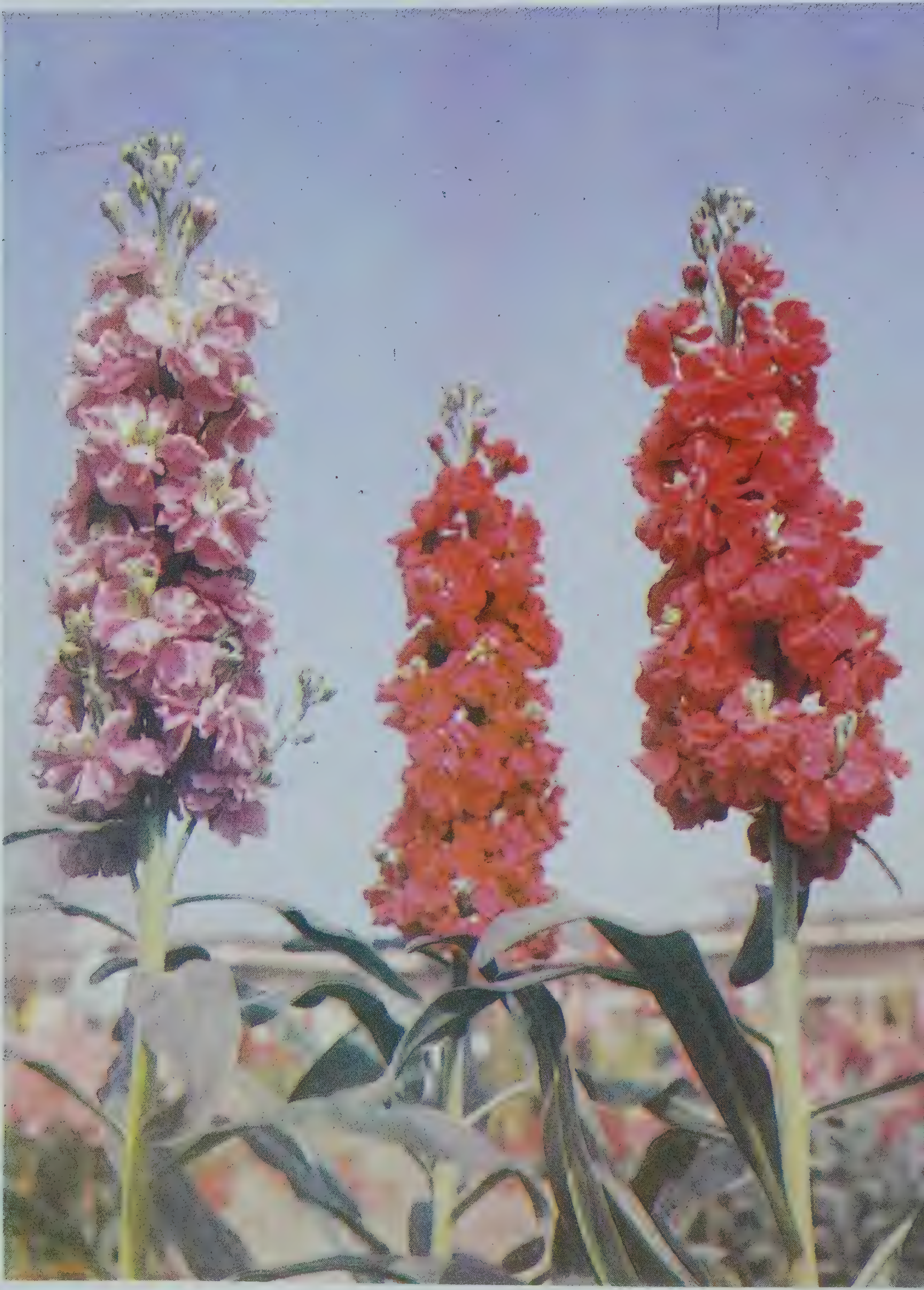

Plate IV—Stock—Column Type

(*See page* 10

GODETIA

Godetia grandiflora and *G. amoena*

Other common names: Satin Flower, Farewell-to-Spring

FAMILY: Onagraceae *ORIGIN:* Western States of North America

Godetia is a very showy annual with tall (60-90 cm) or dwarf (22-45 cm) bushy plants with grey-green, oblong leaves. The flowers are large (5-10 cm), single or double, bell-shaped or hollyhock-like borne in clusters or loose spikes. The flower colour may be pink, purple, crimson, lavender, salmon-pink, bright carmine, orange-cerise, bright orange-red, salmon-rose, dark red, bright crimson, bright rose, soft pink, cherry red, carmine rose, mauve, cattleya-blue and white. The flowers are blotched dark at the centre. In some varieties the flowers have wavy and frilled petals and are mildly fragrant, particularly in the Grandiflora type.

The garden varieties of Godetia have been derived from two species, *G. grandiflora,* a dwarf, and compact species with large flowers produced in clusters and the tall species, *G. amoena,* with flowers borne in loose spikes. These two species, *G. grandiflora* and *G. amoena,* were crossed to produce tall bushy hybrids having long sprays of double flowers in various shades of pink and red which were not found in the tall and loose growing species *G. amoena* and were transferred to it from the dwarf and compact *G. grandiflora.*

The five different types of Godetia are: (1) Dwarf or Grandiflora Single, dwarf-growing (25-40 cm), compact and bushy with single flowers including the varieties Monarch (mixed), Crimson Glow (bright carmine), Duchess of Albany (white), Duke of York (crimson with white), Gloriosa (dark red), Kelvedon Glory (deep salmon-rose), Lady Albemarle (bright crimson), Lady Satin Rose (bright carmine-rose), Orange Glory (fiery orange-cerise), Rosamund (bright rose), Salmon Princess (salmon-rose) and Sybil Sherwood (bright salmon-pink); (2) Dwarf or Grandiflora Double or Azalea-flowered, dwarf (35-45 cm) and bushy with double azalea-like flowers including the varieties Cherry Red, Delicata (soft pink), Mauve, Rosea (pink), Bright Carmine and Carminea (pink); (3) Tall Single—derived from the species *(G. amoena),* tall-growing (60-75 cm) with single flowers in loose spikes; (4) Tall Double (hybrids between *G. grandiflora* and *C. amoena),–tall* (75 cm), bushy with double flowers in long sprays and (5) Lavender and mauve-coloured varieties like Lavender Gem (38 cm) evolved from the species *G. viminea* and other dwarf (25 cm) and mauve or so-called blue-flowered varieties from *G. dasycarpa.*

Godetia is suitable for beds, pots, borders, cut flowers, rock gardens and window-boxes. The tall varieties are ideal for cut flowers.

The seeds are sown in September-October in the plains and from August to October or from March to April in the hills. The seedlings are transplanted into beds after about a month of sowing, preferably at the four-leaf stage. The plants thrive best in a cool, moist, light and well-drained soil and a sunny situation. The land should be well-cultivated.

GLOBE AMARANTH

Gomphrena globosa

FAMILY: Amaranthaceae *ORIGIN:* India

The plants are tall (45-60 cm) or dwarf (25 cm) and bushy with long narrow leaves and small, 2 cm across, clover-like or button-like round flowers borne on long stems well above the foliage. The flowers may be magenta, purple, violet, pink, rose, pale orange or white. The flower-heads are papery in texture and 'everlasting'.

The Globe Amaranth may be grown in beds and borders and for cut flowers. The dwarf varieties are suitable for edgings and rock gardens. The cut flowers can also be dried and used in flower arrangements as these retain their colour when dried.

The seeds can be sown during May-June to grow the plants during the rainy season. They may also be sown in January-February to obtain flowers during summer. In the hills, they are sown during March-April. The seedlings are transplanted later into permanent beds. The plant can be grown successfully in a poor and light soil and in hot and dry locations. It is very hardy and can be grown in any type of soil. A sunny situation is required for a good growth of plants. The plants flower after about 2½ months of sowing.

The commonly grown varieties are the Globosa Mixed (tall) and the dwarf or Lilliput Buddy (purple) and Cissy (white) which are about 15-25 cm tall and are suitable for edgings and rock gardens.

BABY'S BREATH

Gypsophila elegans

FAMILY: Caryophyllaceae *ORIGIN:* Caucasus

This is a dwarf-growing (30-45 cm) annual with small, lance-shaped grey-green leaves and small (0.65 cm across) rounded, open bell-shaped, pearly-white flowers produced in sprays or slender stems. The plants are early and free-flowering and short-lived. When covered with profuse white blooms, they appear like fluffy clouds. There is also a pink-flowered variety.

Covent Garden Market with large white flowers, Carminea (crimson rose), King of the Market (white), London Market (white) and Rosea (pink) are the most popular varieties grown in the gardens.

It is ideal for cut flowers, beds, borders, rock gardens, edgings and for covering bare areas in bulb beds or shrubberies. The flowers are extensively used for flower arrangements and bouquets.

The seeds are sown directly in permanent beds where the plants are to flower. The sowing can be done in September-October. In the hills it can be sown from August to October or March-April. After germination the seedlings are thinned out, about 2.5 cm apart. Since the plants are short-lived, it is better to make successive sowings at intervals of 2 to 3 weeks to obtain continuous blooming. The plants bloom in about 2½ to 3 months after sowing. An open and sunny location is necessary for a good growth of plants.

The perennial species *G. paniculata,* with single or double white flowers, and *G. repens* with trailing habit and small pink flowers can be grown successfully in the hills. Single White, Double White and Early Snowball (double, white) are the popular varieties of *G. paniculata.* Pacifica is a rose-pink-flowered variety, while Repens Rosea is a popular variety of *G. repens.*

SUNFLOWER

Helianthus annus

FAMILY: Compositae *ORIGIN:* Western United States

The popular sunflower is tall-growing (1-3 m), coarse-looking with large rough-textured leaves bearing huge (20-30 cm across) yellow flower-heads with a dark disc on stout and rough stems.

Among the tall-growing (1-3 m) varieties, the Single Tall Yellow including the Mammoth with huge (20-30 cm across) yellow flowers and Tall Double Chrysanthemum flowered, 1.5-2.0 m tall with large 15-20 cm across, double chrysanthemum-like flowers are most commonly grown in the gardens. There are also Dwarf Double varieties like the Sun Gold (90-120 cm tall, golden-yellow, double flowers) and Yellow Pigmy (60 cm tall, compact, medium-sized golden-yellow flowers). From a natural variation having chestnut-red markings on the ray petals which first appeared in California, a red-coloured variety, Sutton's Red, was developed in England which, when crossed later with other varieties, produced some very attractive varieties with chocolate, red, bronze and wine-red flowers.

The Cucumber leaf, Miniature of Japanese Sunflower belongs to another species, *H. dubilis (H. cucumerifolius).* The plants are medium-tall, 90-120 cm high, well-branched and bushy with glossy green foliage resembling a cucumber leaf and small yellow flowers. The plants are very free-flowering. Its most important varieties are Stella with large golden-yellow flowers with a dark centre and Purpureus with bronze-coloured flowers.

The Miniature Sunflower *(H. dubilis)* has been crossed with the Red Sunflower *(H. annus)* mentioned above. The hybrids, known as Sultan's Autumn Beauty, are medium-tall, 1-1.5 m high, well-branched with small flowers borne on long stems. The flowers are pale primrose-yellow, orange-yellow, bronze, chestnut-brown and maroon in colour with long ray petals, many of which are beautifully zoned. There is also a white-flowered variety, Italian White with large, 10 cm across, flowers borne on long stems. The plants are about 1 m tall. Sometimes the flowers are creamy primrose in colour.

The seeds can be sown from January-February to June. The flowers are produced during the summer and rainy seasons. In the hills the sowing can be done in March-April. After about a month of sowing, the seedlings are transplanted into beds. Seeds can also be sown directly at permanent sites where the plants are to flower. The plants thrive best in a well-manured and rich soil and a sunny situation.

The tall sunflower can be used as a screen or in the background or for growing along the hedge or garden wall or in shrubberies. The miniature types and their hybrids are suitable for growing in annual or mixed borders as well as for cut flowers.

STRAWFLOWER

Helichrysum bracteatum

Other common name: Everlasting Flower

FAMILY: Compositae *ORIGIN:* Australia

One of the most commonly grown everlasting flowers is the Helichrysum. The plants are 75-90 cm tall with oblong pointed foliage and flowers, about 7 cm and more across, with petals clustered and incurved towards the centre disc, when these are half open. The flower colour may be crimson, rose, yellow, mauve, salmon-pink, dark red or white. The flowers are papery in texture when mature and last long when dried. The plants are free-flowering.

The garden varieties are known as Monstrosum which have large double flowers. The popular varieties in separate colours are Borussorum Rex (white), Ferrugineum (bronze), Fire Ball (scarlet), Luteum (bright yellow)„ Purpureum (deep red) and Roseum (Pink). The Tall Double Mixed and Dwarf Double Mixed are the two other important varieties of mixed colours. The Dwarf Double Mixed is dwarf-growing (45-60 cm), more bushy and compact with double flowers.

Helichrysum is most suitable for cut flowers. The flowers are picked when half mature and hung in bunches to dry in a cool, airy and dust-proof place. The dried as well as fresh flowers can be used in flower arrangements. The dwarf varieties may be grown for beddings.

The seeds are sown in September-October and seedlings transplanted later into beds after about a month of sowing. In the hills the sowing can be done in March-April. The plants bloom after about 3½ to 4 months of sowing. They can grow well in any kind of soil and do not require heavy manuring. A sunny location is useful for a good growth.

CHERRY PIE

Heliotropium arborescens (H. peruvianum)

Other common name: Heliotrope

FAMILY: Boraginaceae *ORIGIN:* Peru

Although Heliotrope is a perennial, it is commonly grown as an annual. The garden varieties have arisen from two species, namely, *H. peruvianum* and *H. corymbosa.* The plants are about 30-45 cm tall with dark green, lance-shaped leaves and produce large trusses of small tubular flowers. The flower colour may be pink, purple, rose, deep violet or white. The flowers are delightfully scented (vanilla scent). The plants are early and free-flowering.

The popular varieties are Marine, Special (dark violet), Regale Hybrids (dark blue, early), Mme Bruant (dark violet-blue with a white eye), Giant Mixed, Blue Bonnet (large, deep blue), First Snow (white) and Pacific Hybrids (lavender, violet or purple, very fragrant).

The seeds are sown in September-October and the seedlings are transplanted later into permanent beds. In the hills the seeds can be sown in March-April. The plants flower after about three months of sowing. They thrive well in a rich soil and a sunny location.

Heliotrope is suitable for beds, annual borders and pots.

ACROCLINIUM

Helipterum roseum (Acroclinium roseum)

Other common name: Imortelle

FAMILY: Compositae *ORIGIN:* Australia

H. roseum is about 45-60 cm tall with narrow smooth green leaves and double daisy-like flowers (5 cm across) of white pink, rose or chamois colour with golden yellow and dark centres borne singly at the terminal ends of long stems. The plants are early and free-blooming. The flowers are papery in texture and last long when cut or dried.

The commonly grown varieties are Goliath (red shades), Giant Mixture, Albo (white), Rose, Rose and White Mixed.

The seeds are sown in September-October and after about a month the seedlings are transplanted into beds. In the hills the sowing may be done in March-April. The plants flower within 6 to 8 weeks from the date of sowing. They thrive best in a light soil and a sunny situation.

It is suitable for cut flowers, beds and borders.

Another species *H. manglesii (Rhodanthe manglesii)* with clusters of small hanging conical flower-heads of pink and white is also commonly grown in the garden. The plants are 30-35 cm tall. The flower-heads can be dried and used in flower arrangements like those of Helichrysum. It is useful for beds, cut flowers and pots.

CANDYTUFT

Iberis umbellata and I. amara

FAMILY: Cruciferae *ORIGIN:* Europe, including Britain

The popular candytuft *(I. umbellata)* is about 15-30 cm with long narrow leaves and small white, pink, carmine-rose, purple or lilac flowers borne in broad clusters, known as umbels. The flowers are sweet-scented. The important varieties are Alba (white), Carminea (carmine), Liliacina (purple), Purpurea (dark purple) and Red Cardinal (red). There is also a dwarf (15-25 cm) variety Dwarf Fairy, Mixed or Dwarf Hybrid which is mound-like and is completely covered with a multitude of attractively-coloured flowers.

The Hyacinth-flowered candytuft *(I. amara)* is taller (35-45 cm) and erect with 15-cm-long spikes of white flowers resembling the hyacinth. The commonly grown varieties are Improved White Spiral, Iceberg, Empress and Giant Hyacinth-Flowered.

Candytuft is usually grown in beds and borders and for edgings. The Hyacinth-Flowered varieties can be grown in pots also.

The seeds are sown in September-October and seedlings transplanted later into beds. Seeds can also be sown in permanent beds where the plants are to flower and seedlings thinned out 15-25 cm apart. In the hills the sowing can be done in March-April. Flowering commences after three months of sowing. The plants require a light and well-drained soil and an open and sunny situation for a good growth.

BALSAM

Impatiens balsamina

Other common names: Touch-me-not, *Gulmenhdi*

FAMILY: Balsaminaceae *ORIGIN:* India

Balsam is a native of our country. The plants are 25-60 cm tall and free-branching with long lance-shaped thin light green leaves with a toothed margin. The flowers are spurred, 60-75 cm across and Camellia-like borne in leaf axils. The flowers in improved varieties are usually double but there are single or semi-double varieties also. The flower colour may be pink, rose, scarlet, red, violet, salmon-cerise, salmon-pink, purplish-red, chamois-rose, crimson, lilac, rose-pink, purple, azure blue, dark blue, mauve or white. In some varieties, the flowers are beautifully spotted, blotched and variegated with contrasting colours.

Among the tall (45-75 cm) varieties, Double Camellia-Flowered Mixed, Rose-Flowered, Royal Balsams Mixed and Tall Double Mixed, in separate as well as mixed colours, are popular in the gardens. There is a Dwarf Bush-Flowered Mixed or Dwarf Mixed variety, about 45-60 cm tall with double flowers in clusters on the top of the stems, holding the flowers well above the foliage instead of being hidden on the side of the stems, as in most varieties. There is also a very dwarf (25-30 cm) variety, Tom Thumb, which is uniform, bushy and compact with large double blooms of various gay colours.

Balsam can be grown both in summer and in the rainy season. Seeds are sown in January-February for summer flowering and during May-June to obtain blooms in the rainy season. In the hills it can be sown in March-April. The seeds are usually sown directly in permanent beds and seedlings thinned out 25-30 cm apart. The seedlings can also be transplanted, if necessary. The plants bloom with 2 to 2½ months from the date of sowing. They thrive best in a well-manured, rich, moist and well-drained soil and a sunny situation. They can also be grown in partial-shade. The plants relish manuring and plenty of watering. Under dry conditions, the leaves wither and drop off.

It is ideal for beds and pots, particularly the dwarf varieties. It can also be grown along walks and in borders.

The two perennial species, *I. holstii* (Patience Plant) and *I. sultani* (Busy Lizzie), natives of Zanzibar, and their hybrids can also be grown as annuals. These species are also favourite house plants for growing indoors. The plants are 45-60 cm tall, well-branched and free-flowering with small, lilac, salmon-pink, ruby, orange, scarlet, coral rose, deep rose or scarlet-coloured flowers. They bloom almost throughout the year. *I. holstii* is taller (45 cm), while *I. sultani* is dwarfer (15-20 cm). There are also extra dwarf *sultani* (10-15 cm). The important varieties are Holstii Hybrids, Semi-Dwarf Sultani like Bright Orange, Pinkie, Bright Rose, Blaze Scarlet and Mixed, Dwarf Sultani including Orange Baby, Pink Baby, Red Herald, Scarlet Baby and Baby Mixed and Sultani Nana Hybrida.

They are suitable for growing in pots in a semi-shaded situation. The plants thrive well in the living-room. They can be treated like Balsam. The growing point of the plants should be pinched back to make them bushy. A well-drained, moist and rich soil is useful for a good growth.

SUMMER CYPRESS

Kochia scoparia trichophylla

Other common names: Burning Bush, Belvedere

FAMILY: Chenopodiaceae *ORIGIN:* South France and eastwards to Japan

The plants are dense, symmetrical, oval or round in form, about 60-90 cm tall and 30 cm across. The entire plant is densely clothed with finely cut, narrow and pale green leaves and very ornamental. At maturity after the rainy season when the foliage turns bright coppery-red and dainty red flowers are produced, the plants resemble a burning bush.

Kochia is a beautiful seasonal foliage plant ideal for growing in pots and in the ground individually as an ascent or a dot plant and is useful as a temporary hedge or screen. Only one plant should be planted in each pot, preferably in a 20-25 cm pot. It is often planted along paths.

Seeds can be sown from February to June. Kochia grows successfully both in summer and in the rainy season. In the hills, the seeds are sown in March-April. After about a month of sowing, the seedlings are transplanted at permanent sites. The plants grow best in a rich, well-manured and well-drained soil and a sunny situation. They can also be grown in partial shade or on the verandah.

The other variety, Childsii *(Kochia scoparia childsii)*, is also grown in the garden. It remains green throughout its life.

SWEET PEA

Lathyrus odoratus

FAMILY: Leguminosae *ORIGIN:* Sicily

With a wide range of flower colours, delicate fragrance, long duration of flowering and ease in cultivation, the sweet pea is one of the most attractive winter annuals ideally suited for cut flowers and it blends well with any colour scheme in the garden. From its native home in Sicily, it was brought into cultivation at the end of the seventeenth century.

Sweet peas are usually grown as a tall hedge or temporary screen, particularly alongside a path or in a kitchen-garden. They are also grown in clumps or groups in an annual border. The dwarf cupid varieties are useful for edgings and for growing in front of the annual or mixed border. When planted as a hedge, the seeds are drilled directly at permanent sites where the plants are to flower. Seeds are sown about 5-8 cm apart and about 3-5 cm deep, preferably in double rows spaced 30-35 cm apart. After germination, the seedlings are thinned out maintaining a distance of about 15-25 cm between plants.

For growing in clumps, the seeds are sown in circles and usually about 5 to 6 plants spaced about 15-25 cm apart are kept at each site. Seeds of lavender, bluish and mauve-coloured varieties are wrinkled, while those of rose, scarlet and pink-flowered are smooth and plump. The thin-skinned seeds, such as those of salmon-shaded and golden pink varieties as well as wrinkled and creamy-coloured seeds germinate better when placed on a thin layer of sand.

Staking—The plants require staking. For this purpose, thin bamboo poles are inserted in the group along the row at short distances, about 2 m apart and strings or a thin wire stretched and fixed on these posts. Sometimes a cord netting or chicken-wire netting is also fastened to thick bamboo poles or galvanised pipes. The plants grown in clumps are trained on dried sticks or twigs of trees; old dried pigeon-pea or cotton sticks are ideal for this purpose.

Sowing and cultivation—In the northern plains the seeds are usually sown in late September or early October but not later than the third week of October for obtaining a good growth. In those areas where the rainfall is low, sowing can be done in August. The flowering commences in February and continues until March or April. In the hills the seeds are sown from August to October for early flowering in spring or in March-April for late summer or early winter flowering. The different colours of sweet peas generally breed true from seeds. For successfully growing sweet peas, deep digging (45-75 cm) of beds, good drainage, thorough and frequent watering and plenty of sunshine and organic manure, preferably well-rotted cowdung or compost, are essential. The ground must be dug about 60-75 cm deep and sand added to the soil if it is heavy to ensure a good drainage.

The rows of sweet peas should run from north to south to provide full sunshine on both sides of the row. Heavy soaking is better than light sprinkling but overwatering should be avoided as it is harmful and often results in the shedding of flowers. At the time of preparing the ground for sowing, one part of well-rotten cowdung manure and compost should be added to two parts of soil with a little bonemeal, if available. Chemical fertilizers are generally not required. However, a well-diluted liquid manure prepared from cowdung can be used effectively at fortnightly intervals after the appearance of flower-buds. The faded flowers should be removed frequently and seed pots should not be allowed to ripen in order to encourage more flowering.

When the plant is about 10-15 cm tall, its growing point is generally pinched back to make it bushy. However, it is not always necessary to pinch back the seedlings. The plants are usually grown in a bush form but sometimes they may be trained on the cordon system to produce large exhibition blooms. However, this system of training is not practised when the aim is to have a mass effect for garden display. In the cordon method, only one or two main stems are allowed to grow on each plant, while the side-shoots in the leaf axils are removed and the plants are not allowed to flower before they are about 90 cm high. In this method of training, the flowers are larger in size and better in quality though fewer in number.

Varieties—There are numerous varieties of sweet peas. The flower colours are white, cream, pink, scarlet, red, maroon, dark brown, rose, crimson, lavender, light blue, salmon-rose, cherry red, orange, amber, orange-salmon, pale cerise, salmon, rich purple or various other hues. However, deep blue and pure yellow are not yet available. These varieties developed as a result of mutation, chance crossing in nature and artificial hybridization by man. Henry Eckford in England and Luther Burbank in America were the pioneers in hybridising sweet peas. As a result of crossing, new varieties including the Grandiflora having larger flowers with better colours than the original wild types were evolved. Later, at the beginning of the present century, the spontaneous mutation named 'Countess Spencer', having frilled or waved edges of flower-petals, was a landmark in the history of improvement of sweet peas. Now most of the modern varieties are of the 'Spencer' type. The Dwarf Cupid strain also arose by mutation. Further in America, a new strain called Cuthbertson was evolved which is early-flowering, vigorous growing and produces large flowers. The Cuthbertson strain was evolved by crossing the Grandiflora with the Spencer varieties.

The six distinct strains available now are the Giant Frilled Late-flowering Spencers, the Early-flowering Frilled, the Cuthbertson Frilled, the Multiflora or Zvolanek's Multiflora

(5 to 7) blooms to a stem, early-flowering), the Dwarf Cupid (without tendril, non-trailing) and the Dwarf Cupid Giant Frilled or the Little Sweetheart.

The original hooded types and the plain Grandiflora, the latter mainly evolved by Henry Eckford, are not so common now. In our country the early-flowering strains are better than other varieties which generally do better in the hills.

Disease and insect pests—Among the diseases attacking sweet peas, powdery mildew is the commonest. Dusting sulphur is useful in controlling this disease. The aphids, which are the common insect pests found on sweet peas, can be controlled effectively by spraying Basudin or Malathion.

Often birds damage the seedlings in young stages. Black thread or cloth pieces stretched across the row of plants just above them will be helpful in preventing damage by birds. If the seeds are damaged by birds and rats after sowing, it is advisable to dip the seeds into linseed oil and red lead before sowing. However, one must be careful while treating the seeds and not allow children to handle them as red lead is poisonous.

STATICE

Limonium sinuatum

Other common name: Sea Lavender

FAMILY: Plumbaginaceae *ORIGIN:* Mediterranean Region

Limonium sinuatum is a biennial but treated as an annual. The plants are 45-60 cm tall with stiff, angular and winged stems and a dense clump of long deeply-cut grey-green foliage. The flowers are borne in open clusters of short one-sided spikes or sprays at the terminal ends of stems. The flower calyx which is toothed and straw-like provides the colour and the tiny tubular flowers with creamy white petals are inconspicuous. The flower sprays are white, rose, lavender, mauve, dark blue, salmon-pink, orange-yellow, carmine or pink. They retain their attractive pastel shades for a long time when dried and therefore used as 'everlasting' flowers in flower arrangements. The improved varieties are Art Shades, Pastel Shades, Atrocoerulea (dark blue), Candissima (white), Chamois Rose, Rosea (pink), Snow Queen (white), Kampf's Blue Improved (dark blue), Market Growers Blue (deep blue), Purple Monarch (deep purple), Heavenly Blue (bright blue) and Sinuata Mixed.

The large yellow-flowered species *L. bonduelli,* a native of North Africa, is also commonly grown in the garden. It resembles *L. sinuata.*

Another popular annual species, *L. suworowii,* is a native of Turkestan. The plants are 45-60 cm tall with a rosette of long, narrow and toothed foliage above which rises the long (20-30 cm), thick, bright rose-coloured and branched flower scape or spike. The flower spikes are very showy.

The flowers of statice are ideal for cutting and after drying can be used as 'everlasting' flowers. The flower spikes of *L. suworowii* are extensively used for cut flowers and decoration and this species is particularly suitable for growing in pots.

The seeds can be sown directly at permanent sites where the plants are to flower since the seedlings having tap roots are difficult to transplant. However, the seedlings can be transplanted early with care, if required. The sowing may be done in September-October in the plains and in March-April in the hills. The plants flower after about 3 to 3½ months of sowing. They thrive well in a light and well-drained soil, a cool climate and a sunny location.

TOAD FLAX

Linaria maroccana

Other common name: Linaria

FAMILY: *Scrophulariaceae* *ORIGIN:* Spain, Portugal and Morocco

Linaria is an important winter annual. The plants are about 25-35 cm tall, compact, bushy with erect branches and thin narrow leaves. The dainty antirrhinum-like spurred flowers of various attractive colours are borne on short spikes. The flowers are white, yellow, purple, lavender, pink, chamois, golden yellow, rose, blue, mauve, violet-blue or crimson and bicoloured and blotched with different shades on the lip. The plants are early and free-blooming.

The popular varieties are Excelsior (35 cm tall), Northern Lights (30-35 cm) and Fairly Bouquet (25-35 cm, dwarf) which are available in mixed colours.

It is suitable for pots, edgings, borders and rock gardens and for growing in drifts and bulb beds. The flowers are also used for cuttings.

The seeds are sown directly in permanent beds where the plants are to flower. The sowing can be done in September-October in the plains and from August to October and in March-April in the hills. Its fine seeds are mixed with sand when sowing and covered lightly with soil or leafmould and watered carefully. The seedlings are thinned out about 25-30 cm apart. Flowering commences within three months from the date of sowing. The plants make a good growth in a rich well-manured and well-drained soil and an open and sunny situation.

SCARLET FLAX

Linum grandiflorum var. *rubrum*

FAMILY: Linaceae *ORIGIN:* North Africa and Europe

The plants are about 45-60 cm tall with narrow pointed foliage, slender stems and large (2.5 cm across), five-petalled, scarlet flowers with dark centres. The flower petals have a silky sheen and the flowers are borne in loose heads at the end of stems. The variety *rubrum* is the best and there are other not-so-common varieties with pink, bright red or dull blue flowers also. The common Flax *(L. usitatissimum)*, 45-60 cm tall with soft blue flowers, is also grown for ornamental purposes. The plants are free-flowering. The perennial species, *L. perenne,* with azure-blue flowers, grows successfully in the hills.

The seeds are sown in seed-beds or pans in September-October and the seedlings transplanted later into permanent beds. The seeds can also be sown directly in permanent beds and seedlings thinned out 25 cm apart. In the hills, they can be sown in March-April or from August to October. The plants flower after about 3 to 3½ months of sowing. They thrive best in a light and well-drained soil and a sunny situation.

Linum can be grown in beds and borders for a display of colour.

LOBELIA

Lobelia erinus

FAMILY: Companulaceae *ORIGIN:* South Africa

Lobelia is a perennial but treated as an annual. It is low-growing (10-20 cm), with small, oblong, light-medium or dark green foliage and slender leafy stems. The flowers are small, about 2 cm across, and white, pale-medium and dark blue, purple or crimson in colour with a white or yellow eye. Both compact and trailing forms are available. The plants are free-flowering.

The commonly grown varieties with compact growth habit are Blue Stone (blue), Crystal Palace (dark blue), Cambridge Blue (large, light blue), Emperor William (light blue), Mrs. Clibran Improved (deep blue, with a white eye), Rosamond (scarlet red), Snow Ball (white) and White Lady (white). The important trailing varieties are Sapphire (deep blue, with a white eye) and Hamburgia (sky blue, with a white eye).

The seeds are sown in September or October in the plains and in March or April in the hills. The seedlings are transplanted into beds when they are about 2.5 cm high. Its fine seeds are usually mixed with sand while sowing and thinly covered with fine soil. The plants bloom within 3 to 3½ months of sowing. They can also grow successfully in partial shade. They prefer a rich, well-cultivated and moist soil. Feeding the plants with liquid manure once a fortnight during flowering is beneficial.

Lobelia is suitable for pots, edgings, beds, borders, rock gardens, window-boxes and hanging-baskets. The trailing varieties are ideal for hanging-baskets, window-boxes and pots. Lobelia combines well with blue petunias, blue ageratum, pink sweet alyssum, salmon-pink godetia and sky blue Chinese *Delphinium* or blue *Delphinium paniculatum.*

LUPIN

Lupinus

FAMILY: *Leguminosae* *ORIGIN:* America and Southern Europe

Both annual and perennial species of Lupins are grown in the gardens. Among the annual species, the most important is *Lupinus hartwegii* which is a native of Mexico. The plants are 45-75 cm tall with deeply-lobed foliage with finger-like leaflets and small pea-like flowers borne on long spikes carried well above the foliage. The flowers are white, pink or pale blue. The other annual species worth growing are *L. lutens* (45-60 cm) with deep yellow sweetly-scented flowers,*L. sub-carnosus,* the Texas Blue Bonnet (25-30 cm dwarf), with deep blue flowers, *L. mutabilis* (1-1.5 m tall) with dark blue, marked yellow and rose, pink and white or blue, scented flowers, and *L. tricolor (L. hybridus)* 45-60 cm bushy and free-flowering with small white flowers changing to pink.

The perennial species grow best in the hills. Among them the most popular is *L. polyphyllus* which has a wide range of flower colours like crimson, cream, white, blue, yellow, tile-red, rose, orange, flame, bronze, pink, purple, lavender-blue, deep blue and various other shades. The best variety is Russell Strain in mixed, self- and bi-coloured flowers. It takes about a year to flower when seeds are sown in March-April in the hills.

The important varieties of the annual species *L. hartwegii* are Albus (white), Coelestinus (sky blue), Roseus (pink) and Giant King (mixed). The Hybridus Atrococcineus (red, white-tipped) and Hybridus Mixed *(L. tricolor)* and Texanus *(L. sub-carnosus)* with gentian-blue flowers are also available.

Lupins are suitable for beds, borders, cuttings and pots. The dwarf varieties *(L. sub-carnosus)* can be grown in rock gardens.

The seeds are sown directly at permanent sites where the plants are to flower. The best time for sowing is September-October in the plains and March-April in the hills. They can also be sown from August to October in the hills. The seedlings should be thinned out 30-45 cm apart. Soaking its hard-coated seeds into water for a few hours before sowing hastens germination. The plants require partial shade and a well-prepared, light, well-drained and moist soil for a good growth.

FEVERFEW

Matricaria eximia (Chrysanthemum parthenium)

FAMILY: Compositae *ORIGIN:* North Temperate Regions

The plant is commonly listed as *Matricaria* in the flower seed catalogues but is botanically known as *Chrysanthemum parthenium.* It is a perennial plant but cultivated as an annual as it flowers the same year when grown from seeds. The plants are dwarf (30 cm), compact and bushy with very finely-cut leaves and small, quilled, button-like yellow and ivory white flowers. The flower-heads are borne on the terminal ends of the thin stems.

The two other common grown species are *M. capensis* and *M. maritima (M. inodora, Chrysanthemum inodorum)* which produce double white flowers.

The Golden Ball with double golden yellow flowers, Silver Ball or Schneeball, dwarf with double white flowers and Tom Thumb (white) are important varieties of *M. eximia,* while Ball's White and Bridal Robe (white, double) are the popular varieties of *M. capensis* and *M. maritima,* respectively.

Matricaria is suitable for beddings, edgings, pots and hanging-baskets. The flowers of *M. maritima* are ideal for cutting.

The seeds are sown in September-October in the plains and in March-April in the hills. After about a month of sowing the seedlings are transplanted into permanent beds. The plants require a rich and well-manured soil and a sunny location for a good growth.

Matricaria thrives well in the hills and in several places in northern plains like Delhi, Punjab, Uttar Pradesh and other neighbouring areas where winter is long and cool.

STOCK

Matthiola incana

Other common name: Gilliflower

FAMILY: Cruciferae *ORIGIN:* Europe including Britain

Stock is a commonly grown winter annual. The plants are tall or dwarf (30-75 cm), branched or unbranched with long, oblong, light green hairy leaves. The small rosette-like, well-rounded, fully double, fragrant flowers are borne on attractive long and heavy spikes at the ends of sturdy stems. There is a wide range of flower colours including pink, rose, purple, coppery-red, crimson, dark blood-red, lavender, mauve, blue, yellow and white. The plants are free-flowering.

Stock always throws up double and single flowers. The plants with double flowers are sterile and do not set seeds. The single-flowered plants set seeds which are collected for raising plants the following year. It is, therefore, necessary to retain the single-flowered plants in order to collect seeds from them. However, for garden display, the double flowers are preferred. By breeding, it has been possible to evolve varieties which throw up a larger percentage of doubles. The doubleness is an inherited character. The variety Trysomic Seven Weeks gives a very high percentage of doubles and if the few noticeably weaker and smaller seedlings are eliminated at the four-leaf stage, it is possible to obtain 100 per cent double-flowered plants. In another variety, Hansen's 100 per cent Double, evolved in Denmark also, one can obtain all double plants by selecting only pale green leaved seedlings and discarding those having dark green foliage. This difference in the colour of leaves in the seedlings is quite pronounced when these are grown under cool conditions.

The two main forms are the Non-branching or Column and the Branching Stocks. The Giant Excelsior Column, Giant Column, Giant Rocket or Column and Miracle Column are the popular tall-growing (75-90 cm) varieties of the column stock. In the Branching form both dwarf and tall-growing types are available. The large-flowered Dwarf Ten-Week (30 cm) and the tall-growing Giant Perfection Ten-Week (60 cm), Early Giant Imperial or Improved Bismarck (60-75 cm) and Beauty of Nice or Early-Flowering Giants of Nice are the well-known types of the Branching Stock. The Trysomic Seven-Week is the earliest-blooming branching variety with compact spikes and a very high percentage of double-flowered plants. The two other types are the Wallflower-leaved Stock with smooth green leaves including the variety All-the-Year-Round with white flowers and the Dresden Perpetual or Branching Stock. The East Lothian or Intermediate, a dwarf (30-35 cm) and bushy variety with a wide range of flower colours is known as the autumn-flowering stock abroad. There is also a biennial variety, Brompton Stock (30-45 cm), branching and bushy with double flowers in various attractive colours. In each of these types several varieties are available in separate colours as well as in mixtures.

Stock is excellent for cut flowers, beds, borders and pots. The Column type is ideal for cuttings. Bruising the cut ends of the stems before arranging helps to increase the life of the blooms.

The seeds are sown in September-October in the plains and from August to October or in March-April (Ten Week and Trysomic Seven-Week varieties) in the hills. The seedlings are transplanted into permanent beds at the four-leaf stage. The plants flower after about 2½ to 3½ months of sowing, depending upon the variety. For the successful cultivation of Stock, a well-cultivated, rich and well-manured soil with a good drainage and a sunny situation are necessary.

Matthiola bicornis, the Night-Scented Stock from Greece, is a dwarf (30 cm) annual with small (2 cm across) single lilac, strongly fragrant flowers which open in the evenings and close during daytime. It is also grown as a winter annual like the common stock and treated in the same way. The Night-Scented Stock is excellent for edgings.

BLAZING STAR

Mentzelia lindleyi (Bartonia aurea)

FAMILY: Loasaceae *ORIGIN:* California (U.S.A.)

This is an uncommon winter annual, about 45 cm tall with thin, hairy and toothed leaves. The flowers resembling the butter-cup are large, bright yellow with a vermilion base and a central mass of feathery stamens. The flowers are fragrant and open in the evenings. This is an attractive annual worth growing in the garden.

Its seeds are sown directly in places where it is to flower. However, transplanting of seedlings can be done if required. The sowing is done in September-October in the plains and in March-April in the hills. The plants bloom within 3 to 3½ months of sowing. For good growth, they require full sunshine, good manuring, frequent watering and a well-drained soil.

LIVINGSTONE DAISY

Mesembryanthemum criniflorum (Dorotheanthus bellidiflorus)

Other common names: Fig Marigold, Mesembryanthemum

FAMILY: Aizoaceae *ORIGIN:* South Africa

The plants are about 10 cm high, spreading in habit with long (7.5 cm) succulent green leaves that are narrow at the base. The flowers are about 2.5 cm across single and daisy-like in form with an attractive centre. There is a wide range of flower colours including several pastel shades like pink, crimson, yellow, rose, apricot, buff, red, orange, salmon and white. The flowers are self-coloured or white-edged with contrasting colours. They close at night or in dull weather. The plants are very free-flowering. The varieties are available only in mixed colours.

Mesembryanthemum is ideal for edgings, rock gardens, dry walls, pots, shallow pans and hanging-baskets. It is also suitable for growing in the front row of borders and for covering the ground under standard roses.

Seeds are sown directly in permanent places where the plants are to flower. The seedlings are later thinned out 15 cm apart. The sowing can be done in September-October in the plains and in March-April in the hills. The plants grow well in a light and well-drained soil and a sunny location. They can also grow successfully under dry conditions.

MONKEY FLOWER

Mimulus tigrinus

FAMILY: *Scrophulariaceae* *ORIGIN:* Western parts of North and South America

The garden varieties of Mimulus are hybrids of *M. luteus,* its varieties and *M. cupreus* or *M. guttatas.* This is a perennial species but is treated as an annual. The plants are about 30-35 cm high and well branched with angular stems and heart-shaped toothed foliage. The flowers are two-lipped and of attractive colours like crimson, yellow, pink, red and various other shades. The blooms are generally bicoloured, spotted and blotched with contrasting colours, usually with brown and maroon. The varieties are generally available in mixed colours. The plants are free-flowering.

For growing in beds and pots, the Mimulus is an ideal plant. The seeds are sown in September-October in the plains and in March-April in the hills. After about a month of sowing the seedlings are transplanted into permanent beds. The plants flower within 3 to 3½ months from the date of sowing. They require a moist, rich and well-manured soil, plenty of water and a semi-shaded location for a good growth.

The species *Cuprous (M. cupreus)* is also cultivated in the gardens. The Red Emperor is its popular variety.

MARVEL OF PERU

Mirabilis jalapa

Other common name: Four O'clock

FAMILY: *Nyctaginaceae* *ORIGIN:* Tropical America

This is a perennial species but is treated as an annual. The plants are 60-90 cm tall and bushy with heart-shaped pointed foliage. The flowers are tubular, five-lobed and about 2.5-5 cm long. The red, yellow and white-coloured blooms are often beautifully striped and mottled. The flowers open in the afternoon or in a dull cloudy weather. The plants are free-flowering and long-lived. The older plants form tubers which can be used for propagation.

Seeds are sown directly at permanent sites where the plants are to flower. The sowing can be done during January-February, from May to July and in September-October as the plants thrive well in almost all seasons, namely, summer, the rainy season and winter. In the hills the seeds are sown in March-April. The seedlings are thinned out about 45 cm apart. The plants require a light and well-drained soil and a semi-shaded or sunny location.

It is a good accent plant. It can also be grown in a shrubbery, along the wall or fence and in semi-shaded odd corners in the garden.

BELLS OF IRELAND

Molucella laevis

Other common name: Molucca Balm

FAMILY: Labiatae *ORIGIN:* Mediterranean Region

It is an uncommon but very pretty and tall-growing (60-90 cm) annual with curving stems and dark green nettle-like foliage. The enlarged, bell-shaped, pale translucent green, netted and veined calyces produced in the leaf axils are very showy and curious looking, in the centre of each of which is placed a small two-lipped white inconspicuous flower which drops off when the plant matures. The attractive calyces are persistent. The plants are very hardy and free-flowering.

The cut flowers, either fresh or dried, are long-lasting and can be effectively used in flower arrangements. The flower spikes may be cut when they are in their best stage and after removing the leaves, they may be hung upside down in a cool, dry and well-ventilated room to dry. The flower spikes may also be left on the plant to mature when they become ivory-white in colour and can then be used for decoration.

It can be grown in pots or beds from seeds which may be sown in September-October. After about a month of sowing, the seedlings are transplanted into permanent beds. The flowering commences in February and continues until March or April. In the hills, the seeds are sown in March-April. The plants thrive best in a moist, well-drained and rich soil and a sunny situation. They respond well to frequent applications of organic manure like cowdung or leafmould.

FORGET-ME-NOT

Myosotis alpestris

FAMILY: Boraginaceae *ORIGIN:* Europe including Britain

This is a biennial species which is commonly grown as an annual. Both dwarf and tall-growing (30-75 cm) varieties are cultivated. The plants are vigorous, well-branched and bushy with thin and narrow leaves and bearing tiny flowers in clusters on the ends of stems. The flowers are white, pink, sky blue, or dark blue in colour. The popular varieties are Blue Ball, Basket Ball, Gigantea 'Luzzie', Messidor, Victoria, Express and Esther.

It is ideal for pots and beds and for growing in drifts and bulb beds. It can also be grown in rock gardens and mixed borders.

The seeds are sown in September-October in the northern plains and in March-April in the hills. The seedlings are transplanted later into permanent beds. It thrives well in the hills and northern plains where there is a fairly long and cool winter but does not succeed in the southern parts of the country. The plants flower after about six months of sowing. They require a well-drained, light and well-manured soil and a semi-shaded situation for their best growth.

Another species *M. sylvatica* with dark blue flowers is also grown in the gardens.

NEMESIA

Nemesia strumosa

FAMILY: Scrophulariaceae *ORIGIN:* South Africa

The modern garden varieties of Nemesia have originated from the wild plants of *N. strumosa* and its crosses with another species, *N. versicolor.* The plants are 15-30 cm high, straggly or bushy and compact with long lance-shaped leaves. The flowers are small, two-lipped, orchid-like and borne in clusters on long stems. The flowers may be pink, rose, orange, scarlet, cherry-red, crimson, blue, yellow or white and are marked with contrasting colours. The plants are very free-blooming.

Among the tall-growing varieties, Suttonii in separate as well as mixed colours and a more compact form Carnival (mixture) are popular. The dwarf, bushy and compact Triumph (mixture), Orange Prince (bright orange-red) and Fire Ball (scarlet) with larger flowers are also commonly grown. The Hybrids *(N. strumosa x N. versiocolor)* like the Hybrid Blue Gem (pale blue), Hybrid Aurora (red and white bicolour) and Hybrid Mixed are more compact, bushy and decorative with larger flowers.

Nemesia is excellent for cut flowers, pots, beds and borders. The dwarf varieties are suitable for rock gardens, edgings and window-boxes. The large-flowered varieties are ideal for cutting and their cut blooms last for a long time.

The seeds are sown in September-October in nursery beds or seed pans for transplanting seedlings later into permanent beds. In the hills, the sowing is done in March-April. The seeds can also be directly sown in permanent places where the plants are to flower. The plants flower after about 3 to 3½ months of sowing. The growing points of the young plants may be pinched back to make them more bushy. For its successful cultivation, a cool, moist and light soil with sufficient organic manure and an open and sunny situation are essential.

NEMOPHILA

Nemophila menziesii insignis

Other common name: Baby Blue Eyes, Californian Blue-bell

FAMILY: Hydrophyllaceae *ORIGIN:* California (U.S.A.)

A slender-growing annual which has a trailing or spreading habit, 15-20 cm high, with long lobed leaves. The five-petalled, bell-shaped flowers are solitary and sky blue with a white eye. In some varieties, the flowers are deep purple and pure white and spotted. The plant gets covered with numerous small attractive flowers.

Nemophila is suitable for pots, edgings, annual borders, rock gardens and cut flowers. The cut blooms last for a long time when arranged in flower decorations.

Seeds are sown in September-October in seed-pans for transplanting later into permanent beds. In the hills, the seeds can be sown in March-April or in September-October. The plants are fast-growing and flower within three months from the time of sowing. They can be grown successfully in a light and well-manured soil and a semi-shaded situation.

TOBACCO PLANT

Nicotiana alata (N. affinis)

Other common name: Flowering Tobacco

FAMILY: *Solanaceae* *ORIGIN:* Tropical America

This is a perennial species but is treated as an annual. The plants are about 60-90 cm tall, vigorous branching with large, coarse and velvety-hairy foliage. The large (5 cm) trumpet-shaped or tubular flowers with five star-like petals are borne in loose clusters on long stems. The flowers are white tinged with violet, pink, red, crimson, yellow, rose, lavender, mauve, smoky purple, pale green and/or maroon and sweetly-scented. The blooms usually open in the evenings but now day-blooming varieties are also available. The plants are very free-flowering.

The tall-growing Grandiflora *(N. alata grandiflora)* includes the old favourites often listed in nursery catalogues as Affinis and Grandiflora Mixed. Their flowers open in the evenings and are usually of white colour. The Hybrids Sensation Mixed and Day-light (white), obtained from the crosses between *N. alata* and *N. langsdorfii,* produce slightly smaller flowers which unlike those in other varieties open during the day. The dwarfer (45-60 cm) and more compact growing varieties are the Crimson Bedder (deep carmine) and White Bedder.

Another annual species *N. suaveolens* from Australia has slender stems with small, pure white and very sweet-scented flowers. Its most popular variety is the Miniature White.

Nicotiana is suitable for beds, borders, pots (particularly *N. suaveolens)* and for growing in groups in the shrubbery and as accents.

The seeds are sown in September-October in the plains and in March-April in the hills. The seedlings are later transplanted into permanent beds. The plants flower after 3 to 3½ months of sowing. They can be grown successfully in a well-cultivated, rich and moist soil and a sunny or semi-shaded situation. When grown under the shade of trees, its flowers remain open in the day.

CUP FLOWER

Nierembergia caerulea (N. hippomanica)

FAMILY: Solanaceae *ORIGIN:* South America

This is a perennial but is treated as an annual. The plants are dwarf, 15-25 cm tall, erect and bushy with cut foliage and small petunia-like or cup-shaped violet-blue flowers with a yellow eye. The flowers are produced in abundance. The Purple Robe is a popular variety.

Nierembergia is ideal for pots, edgings, annual borders and rock gardens. The seeds are sown during August-October in the plains and in March-April in the hills. The seedlings are transplanted into beds after about a month of sowing. The flowering begins after 3 to 3½ months of sowing. The plants grow successfully in a light and well-drained soil and a sunny situation.

LOVE-IN-A-MIST

Nigella damascena

Other common name: Devil-in-the-Bush

FAMILY: Ranunculaceae *ORIGIN:* Europe and North Africa

The plants are about 45-60 cm tall, upright-growing and bushy with dark green finely-cut, thread-like leaves which surround the flowers. The blooms are large, 2.5-4 cm across, semi-double, rounded and white, blue or rose in colour. The dried balloon-like or egg-shaped and spiny capsules are also used for decoration. The seed capsules have persistent stigmas which resemble horns.

The best variety is Miss Jekyll with sky-blue flowers. The other variety is Oxford Blue (dark blue).

Another species, *N. hispanica* from Spain with grey stems and leaves and violet flowers having red stamens, is also grown in the gardens.

Nigella is ideal for cut flowers and pots. It is also suitable for growing alone or among other tall-growing annuals. The cut flowers and dried seed capsules are commonly used for decoration.

Seeds are directly sown in permanent beds where the plants are to flower and the seedlings thinned out 30 cm apart. The sowing is done in September-October in the plains and from August to October and in March-April in the hills. The plants flower within 3 to 3½ months from the date of sowing. For its successful cultivation, a rich and well-drained soil and an open and sunny spot are essential.

EVENING PRIMROSE

Oenothera

FAMILY: Onagraceae *ORIGIN:* Temperate regions of North and South America

The common Evening Primrose *(Oenothera biennis)* is a biennial, 60-120 cm tall, with erect branches, lance-shaped leaves and large (upto 5 cm across), tubular yellow flowers which open in the evenings. Its two common forms are *'grandiflora'* and *'lamarckiana'* and a better form, the 'After-glow', has red flower stems and calyces. The other biennial species treated as annuals are *O. drummondii,* 30-60 cm high with yellow flowers, *O. odorata,* 60-90 cm tall with primrose-coloured, fragrant flowers and red flower stem, *O. historta,* 30 cm high with yellow and red flowers spotted red at the base which open in daylight and *O. trichocalyx*, 30-45 cm with white sweet-scented flowers that remain open in the daytime.

Oenothera can be grown effectively for borders, beds and rock gardens. Seeds are sown directly in the permanent places where the plants are to flower and the seedlings thinned out 30-45 cm apart. The sowing is done in September-October in the plains and in March-April in the hills. In those areas where the rainfall is low with a low temperature, the sowing can be done earlier in June-July. The plants flower after 3 to 3½ months of sowing. A light and well-drained soil and a sunny location are ideal for a good growth of plants. In a semi-shaded situation, the flowers remain open during the day.

SHIRLEY POPPY

Papaver rhoeas

Other common name: Corn Poppy

FAMILY: Papaveraceae *ORIGIN:* Europe including Britain

The Shirley Poppy *(Papaver rhoeas)* is 60 cm tall with large cup-shaped, single or double flowers with crinkled silken petals borne on long slender stems. The flower colours are white, pink, rose, slaty blue, apricot, terracotta, salmon, scarlet, pale mauve, blue or dark maroon with a white base and in many the edges have a contrasting colour (picotee-edged). In some varieties the flowers are double. The popular varieties are Single Mixed, or Shirley Mixed, Double Mixed, Sweet Briar (deep rose-pink, double) and American Legion (large, scarlet, single with a black cross inside the cup).

The other commonly grown poppies are the Tulip Poppy *(P. glaucum),* an annual from Asia Minor, with a spreading habit with blue-green leaves and bright red flowers and the Opium Poppy *(P. somniferum)* from Greece and the Orient, 60-90 cm tall with blue-green leaves and very showy large double white, salmon-pink, scarlet and white, carnation or paeony-like flowers. The two perennial species usually grown as an annual from seeds are the Iceland Poppy *(P. nudicaule),* 35-45 cm tall with bright green foliage and brilliantly-coloured (white, yellow, orange, pink, rose, salmon or picotee-edged and frilled) flowers borne on wiry stems and the Oriental Poppy *(P. orientale),* 60-90 cm high, with large fiery red, scarlet, crimson, orange-scarlet and pink flowers.

The popular varieties of the Iceland Poppy *(P. nudicaule)* are Coonara (pink), Yellow Wonder, Gartref, Kelmscott, Giganteum, Gartford Giants, Sanford Giants, Sunbeam and Cardinal (red), Emperor (orange) and Mixed. The Mixed and Scarlet are the well-known varieties of the Oriental Poppy and the Dannebrog (Single, scarlet with white cross) is a famous variety of the Opium Poppy *(P. somniferum).*

The poppy is excellent for cut flowers, beds, borders and drifts. The cut ends of flowers may be dipped into boiling water or placed over a flame for a few seconds to seal in the sticky juice. It is best sown in masses.

Seeds are directly sown in permanent beds where the plants are to flower. The seedlings are later thinned out about 25-30 cm apart. The sowing can be done in September-October in the plains and from August to October and in March-April in the hills. The plants flower after 1½ to 3 months of sowing. They thrive best in a light and well-drained soil and a sunny sutiation.

BEARD TONGUE

Penstemon

FAMILY: Scrophulariaceae *ORIGIN:* North America

Penstemon is a perennial but is often treated as an annual. The modern garden varieties have arisen from crosses between *Penstemon hartwegii* and *P. cobaea.* The species *P. barbatus* (Syn. *Chelone barbata)* and *P. diffusus* are perennial. The herbaceous plants are 45-60 cm tall, well-branched with bright green foliage and tubular gloxinia-like blooms borne on long flower spikes. The flowers are white, pink, rose, scarlet, crimson or purple in colour and many are edged with contrasting colours. The plants are very free-flowering and are almost covered with long flower spikes.

The popular varieties include the Giant Floradale (mixed), Rainbow (mixture), Giant Flowered Hybrids and Hybridus Scarlet Queen.

Penstemon is suitable for beds and borders. The seeds are sown in nursery beds or seed-pans and the seedlings are transplanted later into permanent beds. The sowing can be done in March-April in the hills and in September-October in the plains, where there is a fairly long and cool winter. The plants flower within 3 to 3½ months from the date of sowing. Penstemon grows best in the hills where it can be grown as a perennial also. The plants grow well in a rich, well-drained and well-manured soil and a sunny situation. In the hills, the plants can be propagated from divisions and cuttings also.

PETUNIA

Petunia hybrida

FAMILY: Solanaceae *ORIGIN:* South America

Petunia is one of the most popular and attractive annuals grown in the garden. The modern varieties of Petunia are hybrids resulting from crosses between two species, namely, *P. integrifolia* and *P. nyctaginiflora.* The plants may be 25-30 cm or 30-35 cm high with a trailing habit and small, rounded and thick leaves. The flowers are trumpet-shaped and upto 15-20 cm across at the top and attractively coloured. The flower colours may be white, rose, pink, crimson, red, scarlet, pale blue, violet, cream, yellow, salmon-rose, mauve or purple and in some varieties the flowers are bicoloured with star-like patterns. The flowers may have frilled and beautifully veined and marked petals and there are also varieties with fully double flowers. The plants are very free-flowering and the flowering continues for a long period.

The different types of Petunia are:

1. **Dwarf and compact bedding**—Early, dwarf and very

free-flowering varieties: Blue Bird (blue-violet), Cream Star, Peach Red, Rose of Heaven, Rosy Morn, Snowball, Butterscotch, Fire Chief, Lima (White) and Lady Bird (brilliant red).

2. **Grandifloras**—Large-flowered (10-cm and more across).

(a) *Smooth-edged*—Varieties: Bingo (wine-red and white), Dazzler (Carmine), Popcorn (white) and Purple Prince.

(b) *Frilled or fringed*— Flowers have frilled or ruffled petals: The flowers may have slightly ruffled or much ruffled petals. The plants may be dwarf or tall. The Giants of California and California and *Superbissima* varieties have fully ruffled petals; the latter has beautifully veined and marked petals and throat markings. Other popular varieties with ruffled petals are Ramona (mixed), Fringed Snowstorm (white), Theodosia (rose), Defiance (mixed) and Super Frills (giving the appearance of double flowers).

3. **F_1 Hybrids**—Both Multiflora and Grandiflora F_1 Hybrids:

(a) *Multiflora F_1 Hybrids*—The flowers are small with plain-edged petals, Aztec (scarlet red), Comanche (red), Glitters (carmine-red starred white), Coral Satin (rose), Paleface (white), Satellite (rose with white star), Sugar Plum (rosy lavender), Silver Medal (salmon-cerise), Montana (white), Polaris (violet with star), Cherokee (rose) and several others.

(b) *Grandiflora F_1 Hybrids*—The flowers have fringed or ruffled petals and are larger in size. Blue Lace (light blue laced with deep violet), Calypso (scarlet and white), Maytime (salmon-pink), Springtime (bright salmon), La Paloma (white), Red Ensign (scarlet), Snow Lady (white), Pink Magic (rose)and various others.

4. **F_2 Hybrids**

(a) *Grandiflora* F_2 —Carnival (white and pink).
(b) *Multiflora* F_2—Colorama (mixed and Confetti (mixed).

5. **Balcony and Pendula**—Trailing large and small-flowered. Varieties : Blue Wonder, Rose Wonder and Rose.

6. **All Doubles**—Both smooth-edged and ruffled, fully double flowers. Many are bicoloured and all are F_1 hybrids. They originated in Japan but are now available in America, England and Europe. The popular varieties are Cherry Tart (rose and white), Mrs. Dwight D. Eisenhower (salmon), Allegro (salmon), Lyric (salmon-pink), Rhapsody (wine-purple), Caprice (rose-red, carmine rose), Nocturne (purple), Sonata (white), Prestos (bicoloured, rose and white) and Glorious (mixed).

Petunia is excellent for beds, borders, edgings, mass plantings, rock gardens (dwarf varieties), window-boxes (balcony type), hanging-baskets (balcony type) and pots. It is also used for cut flowers and can combine well with shrubs when planted in a mass.

Seeds are best sown from August to October and also sometimes from March to June in the plains, particularly in those areas where summer is not very warm. In the hills, the seeds are sown in March-April. The tiny seeds are mixed with fine sand before sowing to ensure even distribution. The seedlings are transplanted later after about a month of sowing. The all-double varieties are usually propagated from cuttings, particularly in the hills and in areas having a mild climate. Vegetative propagation is practised in the double-flowered varieties because in our country seeds of 100 per cent doubles are not produced and these are generally imported from abroad. The plants require a well-drained and light soil, and a sunny situation for a good growth. They may be pinched back when they are about 15 cm high to make them bushy Occasional feeding with fertilizers or liquid manure during flowering promotes profuse blooming. The faded flowers should be removed frequently to prolong flowering. The plants flower within 3 to 3½ months from the time of sowing.

PHACELIA

Phacelia campanularia

FAMILY: Hydrophyllaceae *ORIGIN:* California (U.S.A.)

The plants are about 20-30 cm high with slender stems and grey-green, toothed foliage and small (2.5 cm across), bell-shaped, deep blue flowers with prominent primrose-coloured anthers. The flowers are brone at the ends of slender stems. The two other species *P. viscida (Eutoca viscida),* 30-60 cm tall with the blue flowers and *P. tanacetifolia,* 45-75 cm with light lavender-blue flowers in curled and clustered flower-heads are also worth growing. The flowers are very attractive to bees. The plants continue to bloom for a long time. Sutton's Blue Beauty is a popular variety.

Phacelia can be grown effectively for edgings and pots and in rock gardens.

Seeds are sown in September-October in the plains and from August to October or in March-April in the hills. The seedlings are transplanted later into permanent beds. The plants grow well in a light and well-drained soil and a sunny situation. They flower during February-March in the plains and during late summer and autumn or early spring in the hills.

PHLOX

Phlox drummondii

FAMILY: Polemoniaceae *ORIGIN:* Texas, New Mexico (U.S.A.)

For a brilliant and long-lasting display in the garden, the annual Phlox ranks high. It is easy to cultivate, very free-flowering and has a wide range of flower colours with a long blooming period. The plants are dwarf or tall, ranging in height from 15-45 cm and bushy with long lance-shaped leaves and large flat clusters 2.5 cm across and delicately-scented flowers held well above the foliage. The flowers are pink, rose, crimson, vermilion, scarlet, salmon, chamois, violet, purple, yellow or white, many with contrasting eyes.

In the variety *Cuspidata,* Star or Stellata, the flower petals are fringed and pointed and the flowers are star-like in shape. Twinkle is a well-known star-phlox. The two other popular phlox varieties are the tall *grandiflora* with large flowers and the *nana compacta,* dwarf with a compact growth habit. These varieties are available in mixed as well as separate colours. The commonly grown varieties of *grandiflora* are Mixed, Fordhook Mixed, Art Shades, Alba (white), Atropurpurea (dark red), Brilliant (rose with a dark eye), Coccinea (bright scarlet), Isabellina (yellow), Kermesina Splendens (scarlet with a white eye), Snowball (white), Vermilion (cinnabar-scarlet) and Violacea (dark blue). Cecily, Globe, Beauty and Sternenzauber are the best varieties of *nana compacta* form, usually available in mixed colours. There are also separate colours in the variety Beauty, such as blue, pink, salmon, scarlet, violet or white. There is also an extra dwarf (20 cm) variety, Globe Mixed, with rounded compact plants. A few tetraploid varieties with larger blooms and stronger stems, such as Glamour (salamon with a cream eye), Tetra Red and Giant Tetra Mixed are also available.

Phlox is excellent for beds, borders and pots. The dwarf varieties are suitable for edgings, window-boxes, pots and beds. The cut flowers, particularly of the large-flowered *grandiflora* varieties, are long-lasting when arranged in decorations.

Seeds are sown from August to October in the plain and the seedlings transplanted into permanent beds when they are 5-7 cm tall. In the hills the sowing is done in March-April. The plants flower after 3 to 3½ months of sowing. They require a rich, well-manured and moist soil for a good growth. An open and sunny situation is useful. However, they can also grow successfully in partial shade.

LADY'S LACE

Pimpinella monoica

FAMILY: Umbelliferae *ORIGIN:* India

This is a tall (1-1.5 m) annual with deeply-cut foliage and small, white delicate flowers borne in large loose sprays at the ends of long and slender stems. The flower umbels resemble those of the carrot.

It is ideal for borders and for growing in the shrubbery or in the background. The cut blooms are excellent for bouquets and flower arrangements.

The seeds are sown in September-October in the plains and in March-April in the hills. The seedlings are transplanted later into beds when they are about 4-5 cm tall. The plants flower after 3 to 3½ months of sowing. They thrive best in a rich and moist soil and a sunny situation. They also grow successfully in partial shade.

PORTULACA

Portulaca grandiflora

Other common names: Rose Moss, Sun Plant

FAMILY: Portulaceae *ORIGIN:* South America

Portulaca is low-growing, about 10-15 cm high, with a creeping habit and small, fleshy, narrow cylindrical leaves. The lustrous flowers are cup-shaped or rose-like, about 2.5 cm or more across, and borne singly at the ends of stems. The flower colours are brilliant shades of scarlet, yellow, rose, pink, salmon, orange, lavender, crimson, purple or white. In some varieties the flower petals are beautifully striped in contrasting colours. Both single- and double-flowered varieties are grown in the gardens. The flowers open in the daytime and close in the afternoon or on dull cloudy days. The plants are free-flowering and form a colourful carpet of flowers. The popular varieties are the Grandiflora Single Mixed and Double Mixed and Magic Carpet. There is also a perennial form with bright deep rose-coloured double flowers.

Portulaca is ideal for a temporary ground cover, rock gardens and edgings and for planting along a path or driveway. It is also suitable for growing in shallow receptacles, bowls or pans.

The seeds are sown from March to September and the seedlings are transplanted later into permanent beds. The plants grow best during summer and the rainy season. They do not thrive well in winter. In the hills, Portulaca can be sown during March-April. For its successful cultivation, a light, well-drained and moist soil and a sunny location are necessary. The plants are very hardy and can grow well without much care.

BABY PRIMROSE

Primula malacoides

Other common name: Fairy Primrose

FAMILY: Primulaceae *ORIGIN:* China

Baby Primrose *(Primula malacoides)* is about 30 cm tall with a rosette of broad leaves at the base, well above which are borne small flowers in huge trusses at the ends of slender stems. The flowers are purple, pale pink, lavender, mauve, deep pink, crimson, rose-red, slamon-rose, white or lavender-mauve.

It can be grown effectively in pots and beds and for cut flowers. The seeds are sown in September-October in the plains and in March-April or August-September in the hills. The seedlings are transplanted later into permanent beds. It flowers in February-March in the plains and during July-October or in spring in the hills. The plants grow successfully in a sunny or semi-shaded situation and a well-drained and rich soil with sufficient humus. It thrives best in the hills and can grow well in the plains where the winter is cool and long.

The important varieties are Glory of Riverside (salmon-rose), Mrs Eriksson (rose-red), White Giant, Fancy (light rose), Fatima or Erica (salmon-red), Gratulation (salmon-red), Dr. Bohnert (purple-red), Purple King, Rosita (rosy-red), Samba (cherry-red), Sari (bright pink), Gigantea, Regent Brigid (bright pink) and Lola (purple-blue).

The other species of Primula which are commonly grown in the gardens are the Sinensis (*P. sinensis*), Obconica *(P. obconica*), Kewensis *(P. kewensis*), Common Primrose *(P. vulgaris*) and Polyanthus *(P. polyantha* or *P. variabilis*). They are cultivated in the same way as *P. malacoides.* Some Primulas like *P. obconica, P. vulgaris* and *Polyanthus (P. polyantha)* grow best in the hills.

P. sinesis: Chinese Primrose—It is 25 cm tall with dark green foliage and large fringed flowers of blue, white, red, rose, cinnabar-red, orange red, scarlet, cerise or carmine-purple borne in clusters. Popular varieties include Alba Pura (white), Cardinal (cinnabar-red), Coerulea (blue), Dawn (soft pink), Dazzler (orange-red), Defiance (dark scarlet), Papa Volpp (cerise with a brown ring) and Zukunft (carmine-purple).

P. obconica—It is about 35 cm tall with large flowers produced in huge clusters on strong stems. The two important forms are the Grandiflora and Gigantea. The varieties are Mixed, Alba (white), Carmine Salmon, Coerulea (blue), Dondo (dark velvety red), Fasbender (dark blue, red, white or rose), Humburg Red, Glory of Aalsmeer (dark pink), Illumination (salmon-red), Salmon Queen and Vulcano (dark red).

P. kewensis—This originated from the cross between *P. floribunda* and *P. verticillata.* The flowers are golden yellow. Yellow Master is a choice variety. It is good for growing in pots.

P. vulgaris: Common Primrose—This is the old and common primrose with yellow flowers. Several new flower colours are also available now. It is used for growing in pots, beds and drifts and for cut flowers.

P. polyantha: Polyanthus—It is a native of Europe and Great Britain. It organiated from the cross between *P. vulgaris* and *P. veris* (cowslip). The flowers are very large and the colours include yellow, white, pink, rose, crimson, blue, scarlet, red and various other shades. This is excellent for cut flowers, pots and beds. It grows best in the hills. It does not thrive well in the plains.

There are two important species of *Primula*, namely, *P. rosea* and *P. denticulata*, which are natives of the Himalayas and are popular in England and other countries of Europe. These species are suitable for growing only at high elevations.

MIGNONETTE

Reseda odorata

FAMILY: Resedaceae *ORIGIN:* North Africa

The flowers are much prized for their delightful fragrance. The plants are 30-45 cm tall with a sprawling habit and light green foliage. The flowers are small, bronze, white, red, crimson, or light yellow produced in loose spikes. Though not attractive, they are sweetly-scented.

The newer large-flowered but less fragrant varieties like the Red Goliath, Golden Goliath and Crimson Giant are now commonly grown in the gardens. The varieties Machet, Odorata Grandiflora, Conqueror and Common Sweet Scented are highly fragrant.

Mignonette is excellent for pots, beds and cut flowers and for growing near the window and in the shrubbery.

The seeds are directly sown at permanent sites and the seedlings thinned out 15-25 cm apart. The sowing is done from August to October in the plains and in March-April or August-October in the hills. The plants flower after 3 to 3½ months of sowing. They grow best in a light, well-drained and moist soil and a sunny situation.

CONE FLOWER

Rudbeckia bicolor

FAMILY: Compositae *ORIGIN:* North America

Rudbeckia is a showy annual, 45-60 cm tall, with lance-shaped leaves and large (5 cm or more across), daisy-like yellow flowers with a mahogany crimson central zone and prominent dark raised centres. The flowers are borne on long stalks.

It is ideal for cut flowers, beds and borders. The seeds are sown in August-September in the plains and in March-April in the hills. The plants grow well in a rich soil and a sunny situation.

The other species, *R.hirta(Black-eyed* Susan), which is a biennial, can be grown as an annual. It bears large flowers, upto 15 cm across. The flowers are light yellow, orange, bronze, rich crimson or mahogany, many with contrasting zones and dark centres and borne on long (60-70 cm) stalks. The blooms may be single, semi-double or double. The popular varieties include the Pinwheel (mahogany and gold), Golden Daisy (golden yellow with a dark eye), Mixed, Autumn Frost (red, brown and bronze), Hirta Hybrids like Goldflamme (orange with a brown centre) and Mein Freund (yellow, large), My Joy (golden yellow), Kelvedon Star (deep yellow with a mahogany zone and a brown eye), Starlight (semidouble, yellow to mahogany with a dark eye) and Double Daisy (golden yellow, double). There are tetraploid varieties also like the Giant Gloriosa Daisies with very large flowers, about 12-18 cm across. There is also a tetraploid variety with double flowers. It can also be grown in the same way as *R. bicolor* mentioned above.

PAINTED TONGUE

Salpiglossis sinuata

Other common name: Velvet Flower

FAMILY : Solanaceae *ORIGIN* :Chile

Salpiglossis is a very beautiful annual worth growing in the gardens. The plants are 60-90 cm tall and bushy with oblong, sticky, light green leaves and large (5 cm across) trumpet-shaped or petunia-like flowers of a velvety texture. The flowers are white, gold, deep yellow, crimson, rose-crimson, chamois, buff, lavender, orange, scarlet, blue, deep violet, primrose or pink and beautifully veined, netted and mottled, often with splashes of gold. The plants are free-flowering.

The two popular varieties are the large-flowered Grandiflora and the Superbissima, with a non-branching and columnar habit of growth. The Gloxiniaflora, Emperor (tall) and Bolero (dwarf), and an F_2 hybrid are the other commonly grown varieties available in mixed colours.

Salpiglossis is excellent for cut flowers, beds and pots. It can also be grown effectively as a background behind some annuals like lineria, nemesia, petunia and salvia.

The seeds are generally sown directly at permanent sites and the seedlings thinned out about 30 cm apart. The transplanting of seedlings can also be done, if required. The sowing is done in September-October in the plains and from August to October or in March-April in the hills. The plants flower after about 4 to 4½ months of sowing. They thrive best in a rich, well-drained and moist soil and a sheltered and sunny location.

SAGE

Salvia

FAMILY : Labiatae *ORIGIN:* Mexico, California, Brazil

The three important annual species are *S. splendens,* the *Scarlet* Sage and *S. horminum,* often known as Clary, and *S. coccinea.* Besides these, two perennial species like *S. farinacea* and *S. patens,* usually treated as annuals, are also grown in the gardens.

S. splendens: Scarlet Sage—The plants are tall (60-90 cm) or dwarf (20-30 cm), bushy with long dark green foliage. The tubular dazzling scarlet flowers are borne in long terminal spikes that are held well above the foliage. The flowers in some varieties are also salmon, pink or violet. The dwarf and early varieties are the St. John's Fire (30 cm), Fire Dwarf, Blaze of Fire (30 cm) and Scarlet Pygmy (20 cm), while Bonfire (60-90 cm early), Fireball (30-45 cm), Harbinger (45 cm), Scarlet Queen (60 cm), Gaiety (60 cm), Scarlet Piccolo, Crimson, King and Violet Queen are the tall-growing varieties. The Scarlet Sage can be grown as an attractive foil to evergreen plants with dark green broad foliage and blue or white-flowered annuals like petunia or verbena.

S. horminum, the Clary or Blue Beard. It is a native of South Europe. The plants are 45-60 cm tall and bushy with small pink, purple, blue or white showy flowers in terminal spikes. Monarch Bouquet (mixed), Pink Lady and Blue Beard are the popular varieties.

S. coccinea—This is a very popular salvia grown in South India. The plants are about 75 cm tall. The flowers are small, red, scarlet, pink or white produced in long terminal spikes. The commonly grown varieties are the Red Indian, Pink Pearl and White Dove.

S. farinacea—The plants are about 60-90 cm tall with bright dark green leaves and attractive long terminal spikes of light or deep blue flowers. There is also a white-flowered variety. The important varieties are the Lavender Blue, Blue Bedder (deep blue) and White.

S. patens—This is about 45-60 cm tall with pale blue or brilliant blue flowers in long spikes. The Cambridge Blue (sky-blue) and Lavender Lady (lavender-blue) are two important varieties.

Salvia is ideal for beds, pots, backgrounds and rock gardens (dwarf varieties). It can be also grown in the shrubbery, below tall trees, in semi-shaded corners and indoors as an attractive house plant.

The seeds are sown in August-September in the plains and in March-April and September-October in the hills. The fine seeds are sown with great care and covered lightly with sand and leaf-mould. The seeds germinate slowly after about 10 to 15 days of sowing. The seedlings are transplanted into permanent beds when they have developed their first true leaves. The flowering commences within 3 to 3½ months from the time of sowing. For the successful cultivation of salvia, a rich, well-drained and moist soil and a semi-shaded situation are useful.

CREEPING ZINNIA

Sanvitalia procumbens

FAMILY: Compositae *ORIGIN:* Mexico

The plants are low-growing (7.5-10 cm) and spreading in habit with small leaves. The daisy-like small flowers are golden yellow with dark centres. The flowers may be single or double.

Sanvitalia can be grown effectively for edgings and in rock gardens. The seeds are generally sown directly at permanent sites and seedlings thinned out later. The sowing can be done in September-October or sometimes earlier in the rainy season, particularly in those areas which have a low rainfall. In the hills, the seeds are sown in March-April. The plants grow successfully in a well-drained soil and a sunny situation.

SOAPWORT

Saponaria calabrica

FAMILY: Caryophyllaceue *ORIGIN:* Europe

Saponaria calabrica is dwarf-growing (15-30 cm) with broad long leaves and small (1 cm across), star-shaped pink flowers produced in loose panicles in the leaf axils. Another species *S. vaccaria (Vaccaria vulgaris)* is also well known. This is a tall (60-90 cm) annual species with pink or white flowers.

This annual is excellent for cut flowers. It can also be grown in front of the borders. The dwarf varieties are suitable for edgings and rock gardens.

The seeds are sown during September-October in the plains and in September or March-April in the hills. The seedlings are transplanted later into permanent beds. The seeds can also be sown directly at permanent sites where the plants are to flower and seedlings thinned out about 30-45 cm apart. The flowering commences within 2 to 3 months from the date of sowing. A sunny location and a well-drained and rich soil with sufficient humus are necessary for a good growth of plants.

PINCUSHION FLOWER

Scabiosa atropurpurea

Other common names: Sweet Scabious, Mournful Widow, Mourning Bride

Family: Dipsaceae *ORIGIN:* Southern Europe

This colourful annual is about 60-90 cm tall and bushy with deeply-lobed leaves. There are also dwarf-growing (30-

45 cm) varieties. The compact, rounded or cone-shaped flower-heads of lavender, maroon, salmon pink, deep rose, scarlet, crimson, purple, lavender-blue, mauve, deep mahogany, blue, yellow and white are borne at the ends of long, slim and stiff stems. The flower-heads bristling with light-coloured stamens and contrasting petals appear like pincushions.

The popular tall varieties are the Giant Imperial Hybrids (mixed), Black Knight (velvety black-purple), Blue Moon (azure blue, wavy petals), Bridesmaid (salmon-rose), Coral Moon (salmon-red), Lavender Moon (light lavender-blue), Loveliness (salmon-rose), Oxford Blue (deep blue) and Silver Moon (white, large). The dwarf and compact-growing varieties including Heavenly Blue (azure-blue) and Peace (white).

Scabious is ideal for cut flowers, borders and pots. It should be grown in clumps in the borders for an effective display. It combines well with phlox and gypsophila.

Seeds are sown in September in the plains and in August-September and March-April in the hills. In the plains, it grows best in those areas which have a long and cool winter. The seedlings are transplanted later into permanent beds, about 30 cm apart. The growing points of young plants should be pinched back to make the plants bushy. The plants may be grown closely spaced so that they support each other and thus prevent the drooping of flower-heads. The flowering starts late, usually after 4 to 4½ months of sowing. The plants grow successfully in a light and well-drained soil and a sunny location.

BUTTERFLY FLOWER

Schizanthus wisetonensis (S. hybridus)

Other common name: Poor Man's Orchid

FAMILY: Solanaceae *ORIGIN:* Chile and Peru

The garden varieties of *Schizanthus* have come from the crosses between two species, namely, *S. grahami* and *S. pinnatus.* The plants are erect, well-branched, about 90 cm tall with deeply-cut fern-like foliage and masses of numerous small, 2.5 cm across, attractively-coloured butterfly-like or orchid-like blooms. The plant is almost entirely covered with exquisite flowers. The flowers are pink, rose, purple, lilac, apricot, yellow, salmon, carmine, mauve, cardinal-red, or white and beautifully marked, blotched, veined and spotted in contrasting colours. There are also dwarf (45 cm) and compact-growing varieties. The plants are free-flowering.

The well-known varieties are the Angel Wings (mixed), Excelsior (mixed), Monarch (mixed), Butterfly Giants, Large-flowered or Giant Hybrids, Crimson Cardinal, Brilliance, Cattleya Orchid and Dr. Badger's Mixed. The dwarf and compact varieties include the Dwarf Bouquet and Pansy Flowered (self-colours).

This annual is excellent for pot culture and cut flowers. The dwarf varieties can also be grown in rock gardens.

The seeds are sown in September-October in the plains and during March-April in the hills. The seedlings are transplanted when they have developed 4 to 6 leaves. It grows best in the hills and in those areas in the plains where winter is cool and long. For its successful cultivation, a light, well-drained and moist soil and a sunny or semi-shaded situation are necessary. The young plants should be pinched back to make them bushy. Feeding with a liquid manure at the time of flowering is often beneficial to the plants. The plants are severely attacked by a virus disease which often kills them.

CINERARIA

Senecio cruentus

FAMILY: Compositae *ORIGIN:* Canary Islands

Cineraria is one of the best shade-loving plants. The species *Senecio cruentus* is the progenitor of the modern garden Cinerarias. The plants are about 30-60 cm high with beautiful large, heart-shaped dark green leaves. The large (8-9 cm) daisy-like and brilliantly-coloured flowers are borne in huge compact clusters or heads held well above the foliage. The flowers are white, lavender, pink, purple, scarlet, red or blue. They may be self-coloured or with contrasting white centres or well-defined margins and rings of various shades.

The different forms grown are the tall and compact Large Flowered Singles, Stellata Singles with star-like petals and open habit, Feltham Beauty Strain having flowers with white centres, Intermediate varieties which are freely branching with smaller heads and the Multiflora Nana or Dwarf including the Nana Compacta having dwarf compact habit. The double-flowered strains are not so popular as the singles. The Copenhagen Market, Early Favourite, Master, Zonal Types, Maxima Grandiflora, Hybrida-Grandiflora, Maxima Nana, Erfurt Dwarf and Nana Multiflora are the mixed coloured varieties. The Early Favourite is also avialable in separate colours like the blue shades, crimson and blood red shades, rose and salmon-rose shades and rusty shades.

Cineraria is excellent for growing in pots and in shaded or semi-shaded situations. The soil mixture for pots contains two parts soil (loam), one part leafmould and half a part sand with a little wood ash.

The seeds are sown in September-October in the plains and the seedlings are transplanted when they are quite small. The plants flower during February-March. Since the plants take a longer time to bloom, the sowing should be done early in September. Seeds can also be sown in August to obtain early flowering. In the hills the sowing can be done in March-April. The plants should be shaded from strong sunlight and watered frequently. A light, well-manured and well-drained soil and a semi-shaded situation are essential for a good growth of plants. Feeding with liquid manure once a fortnight at the time of flowering is useful.

The two annual species, *S. arnearius*, the Annual Cineraria and *S. elegans (Jacobaea elegans)* are also grown in the gardens. The Annual Cineraria *(S. arnearius)*, a native of South Africa, is dwarf (30 cm) with small cineraria-like single blooms of several colours like lavender mauve, rosy lavender, light-yellow apricot and bronzy apricot. It is ideal for cut flowers, rock gardens and annual borders. The other species, *S. elegans*, often known as Jacobaea is tall (45-60 cm) with single reddish-purple flowers with attractive yellow centres. The flowers may also be rich-rose and purple magenta in colour and double in some varieties. This is commonly used for cut flowers. Both species can be treated in the same way as the garden cineraria.

CATCHFLY

Silene pendula

FAMILY: Caryophyllaceae *ORIGIN:* Mediterranean Region

This is a dwarf-growing (15-25 cm) bushy annual with lance-shaped, hairy foliage and sprawling stems. The single or double flowers are produced in loose clusters and may be white, pink, rose, purple, salmon, lilac or crimson.

Silene can be grown in bulb beds and for beddings. The seeds are sown in September-October in the plains and in autumn (August to October) and March-April in the hills. The seedlings are transplanted later into permanent beds. The plants flower within 3 to 3½ months from the time of sowing.

They thrive best in a light and well-drained soil and a sunny situation.

Another commonly grown species is S. *oculata*, popularly known as Viscaria. This is 30-45 cm tall or sometimes 15 cm high only with attractive flowers in pleasing shades of pink, red, carmine and blue and white. It is good for growing in pots. The two other species worth growing are S. *armerta*, 30-35 cm high with bright pink flowers and S. *fuscata (pseudo-atocion)*, 20-30 cm high, having star-like bright pink blooms and are free-flowering.

MARIGOLD

Tagetes

FAMILY: Compositae

ORIGIN: African Marigold *(Tagetes erecta):* Mexico;
French Marigold *(Tagetes patula):* Mexico and
South America

Because of their ease in cultivation, wide adaptability to varying soil and climatic conditions, long duration of flowering and attractively-coloured flowers of excellent keeping quality, the marigolds have become one of the most popular flowers in our country. The marigolds are commonly grown in gardens both in the urban and the rural areas and are cultivated commercially for use as cut flowers. They are ideal for garden display and cut flowers, particularly for garlands. They can be successfully grown in the pots too and are used in mixed borders and beds. The dwarf varieties, especially of the French marigolds, can be grown in window-boxes, hanging-baskets, rockeries as well as for edgings. They are also ideal for growing in a newly-planted shrubbery to provide colour and for planting in blank spots in the garden. The French marigolds can also be grown effectively in drifts and along paths or a drive-way.

There are two common types of marigold, the African (*Tagetes erecta*) and the French (*Tagetes patula*). The African marigold is a native of Mexico, while the French marigold, which is mostly dwarf, has its native home in Mexico and South America. Both have deeply cut foliage with a characteristic odour.

The African Marigold The African marigolds are generally tall (up to 90 cm) with large-sized double globular flowers of lemon, yellow, golden yellow, primrose, orange or bright yellow colours. There are also the nearest-to-white marigolds though not pure white. The size of blooms may be as large as 15 cm across in some varieties. Usually the double varieties throw up a few singles. There are also dwarf (20-30 cm) varieties having large double flowers.

The popular varieties are the Carnation-Flowered (Cracker jack, Guinea Gold, Man-in-the-Moon, Mayling, Smiles, Sun Giants, Fiesta, Titania and Yellow Supreme), with medium-sized carnation-like double flowers and the Chrysanthemum-Flowered (Crown of Gold, Glitters, Goldsmith, Mammoth Mum, Geraldine, Giant-Fluffy and Yellowstone), tall-growing with fluffy and shaggy flower-heads like an incurved chrysanthemum, including the dwarf-growing chrysanthemum-flowered varieties (Cupid, Happiness, Mistral, Pot o' Gold, and Spun Gold) which are 20-30 cm tall with flowers 5 to 7.5 cm across. There is also the dwarf (35 cm) Honeycomb with large deep orange flowers with tubular petals resembling a honeycomb.

A few varieties (Hawaii, Crown of Gold, Cupid and Honeycomb) having odourless foliage have also been raised both in the Carnation and Chrysanthemum-Flowered types. Besides, there are the giant-flowered, uniform and vigorous F_1 hybrids like the Climax and Toreador, producing globular fully double-ruffled blooms up to 15 cm across in profusion which are ideally suited for cutting and garden display.

The French Marigold The French Marigolds are mostly dwarf, early-flowering and compact with dainty single or double blooms, 2.5-5 cm across, borne freely and almost covering the entire plant. The colour of flowers may be yellow, orange, golden yellow, primrose, mahogany, rusty red, tangerine or deep scarlet or a combination of these colours. The flowers may be self-coloured, spotted, striped or blotched. The height of plants varies from 15 cm in extra dwarf varieties to 45 cm in others. The dwarf double varieties are the Flame, Flaming Fire Double, Rusty Red and Spry and the extra dwarf-flowered varieties are the Petites (Gold, Yellow, Orange and Harmony), Fireglow, Brownie Scout, Pygmy, Gypsy, Lemondrop, Orange Flame, Sunkist and Tom Thumb. The Naughty Marietta, Legion of Honour and Dainty Marietta with petals blotched maroon at the base, Red Head, Harmony and Star of India are important dwarf varieties having attractive single flowers. The variety Harmony has a deep orange centre with an edge of crimson petals and the Star of India bears deep crimson flowers that are attractively striped and marked with golden yellow. A tetraploid French marigold, Tetra Ruffled Red, is also available.

The Single Signet *(Tagetes Tenuifolia)* Another dwarf type of marigold is the Single Signet. The plants are 30-35 cm tall, bushy with fine lacy foliage and covered with small single flowers of orange, yellow or lemon colour. A dwarfer variety, *Pumila,* is about 25 cm high and very compact. The important varieties are Lulu, Golden Gem, Gnome and Ursula. These can be grown for edgings or in rock gardens.

Interspecific Hybrids In America, the interspecific hybrids between the African and French marigolds, known as the Red and Gold Hybrids, are also available. These hybrids have intermediate characters and are early-flowering, medium-tall (60 cm), bushy with double flowers that are 5-7.5 cm across and of delightful colour combinations of red and gold including pure golden yellow, orange, bright red and rich mahogany-scarlet. A triploid interspecific hybrid, named Nugget, with yellow flowers has been evolved in America. A similar F_1 hybrid has been developed at the National Botanical Research Institute, Lucknow (U.P.).

Culture:– The marigolds are very hardy and can be successfully grown in different types of soil and climate. The French marigold grows best in a light soil, while the African marigold requires a rich, well-manured and moist soil. A well-drained soil and a sunny situation are essential for both types of marigolds. They can grow in almost all seasons except in very cold weather as they are susceptible to frost. The seeds are sown in May-June in nursery beds or in shallow seed-pans or boxes. The sowing can also be done from August to October and in February-March. In the hills, the sowing is done in March-April. It is useful to prick the seedlings when these are about 2.5-5 cm tall. After about a month of sowing, the seedlings can be transplanted into beds or in 25-cm pots. During the rainy season, plants can be raised by stem cuttings also. The plants should be grown in a well-prepared soil which has a liberal application of cowdung manure. The French marigolds should not be heavily manured, otherwise these may produce excessive vegetative growth resulting in poor flowering. As soon as the first flower bud appears, the shoot is pinched to make the plants bushy and compact. In general, the marigolds are hardy and almost free from diseases and insects.

MEXICAN SUNFLOWER

Tithonia rotundifolia (T. speciosa)

FAMILY- Compositae *ORIGIN:* Mexico

The Mecian Sunflower *(Tithonia rotundifolia)* is a tall-growing (1.2-1.8 m) plant with coarse, large heart-shaped leaves and deep orange-red, single dahlia-like flowers with tufted yellow centres. The flowers are large, about 7.5-10 cm across. There is a smaller variety, Torch, about 1.2 m tall with large fiery orange-red blooms. The plants are free-flowering.

Tithonia can be grown effecively for backgrounds and hedges. It is ideal for growing as a screen or along the hedge and garden wall and also for cut flowers. The cut blooms often droop when not cut at a proper stage. The flower stems should be handled carefully as they break off easily.

The seeds are sown in May-June to obtain flowers in the rainy season. The sowing can also be done in August-September. The seeds are either sown directly in permanent beds where the plants are to flower or the seedlings transplanted later into beds. In the hills seeds are sown in March-April. The flowering commences after about three months of sowing. The plants thrive best in a rich light soil and a sunny situation. They are quite hardy and healthy.

WISH-BONE FLOWER

Torenia fournieri

FAMILY: Scrophulariaceae *ORIGIN:* Tropics including Africa and India

A few species of *Torenia* are natives of our country. The best species is *T. fournieri* which is commonly grown in the gardens. It is a dwarf (30cm), compact and bushy annual with small bronze-green leaves and dainty antirrhinum-like flowers. The flowers are light blue in colour, blotched deeper blue or violet on the lower lips with a golden-yellow throat. Besides the popular variety Fournieri, there is also the White Wings with ivory-coloured flowers that are tinted rose. The plants are very free-flowering.

Torenia is excellent for beds, borders, pots, window-boxes, rock gardens and hanging-baskets. It can also be grown for edgings. For an informal effect, it may be grown in drifts under tall trees.

The seeds are sown from March to June and the seedlings transplanted into beds at the four-leaf stage. Torenia grows best during the rainy season. In the hills, the sowing can be done in March-April. The plants flower after about three months of sowing and continue to bloom for a long time. They thrive well in a light, well-drained, richly manured and moist soil and a partially-shaded location. They need plenty of water and humidity.

LACE FLOWER

Trachymene coerulea (Didiscus coeruleus)

Other common name: Blue Lace Flower

FAMILY: Umbelliferae *ORIGIN:* Western Australia

The plants are about 45-60 cm tall with finely divided leaves. The small blue flowers are borne in small (5-7.5 cm across) umbels or umbrella-like clusters on long stems. There are also varieties with white and pink flowers, though the blue-flowered one is the most commonly grown variety.

The Blue Lace Flower is excellent for cut flowers and pots. It can also be grown in a mixed border.

The seeds are sown directly at permanent sites where the plants are to flower. The seedlings do not easily withstand transplanting. The sowing can be done in September-October in the plains and in March-April in the hills. The flowering starts after about three months of sowing. The plants require a light and well-drained soil and a sunny situation for a good growth.

NASTURTIUM

Tropaeolum majus

FAMILY: Tropaeolaceae ORIGIN: Mexico and South America

The garden nasturtium has originated from the species *Tropaeolum majus* by selection of natural variation and by hybridization with other species, like *T. minus* and *T. peltophorum (T. lobbianum).* This is a well-known annual in which both tall climbing and dwarf compact types are available. There are also semi-tall Gleam varieties with semi-climbing habits and sweetly-scented flowers. The dwarf varieties are about 25-30 cm high, while the climbing or trailing ones can reach a height of about 1.80-2.40 m. For climbing the plants need support, such as chicken-wire net or wire-mesh. The plants have large rounded leaves with wiry stems and large, up to 7 cm across, spurred flowers. The flowers are orange, salmon, primrose, orange-red, scarlet and deep mahogany, many beautifully marked and spotted in constrasting colours.

The four main types of nasturtium are the Tall Climbing Single, Semi-double Gleam, Dwarf Single and Dwarf Double. Atropurpureum (dark red), Lucifer (scarlet), Spitfire (fiery scarlet) and Mixed are the popular Tall Single varieties. The Semi-double Gleam includes the Golden Gleam, Orange, Salmon and Scarlet Gleams, Indian Chief (scarlet, dark foliage) and Gleam Mixed. The Empress of India (dark scarlet), Gold King (golden yellow, dark foliage), King of Tom Thumbs (scarlet) and Mixed are the best varieties of the Dwarf Single type. The Dwarf Double varieites are the Golden Globe, Scarlet Globe, Mahogany Gem, Orange Gem, Salmon Gem, Scarlet Empress, Cherry Rose, Gem Mixture and Globe Mixed. In the varieties Cherry Rose and Jewel Mixed, the flowers are held above the foliage unlike other varieties in which the blooms are hidden by the leaves.

The tall climbing nasturtiums are useful for a temporary screen, for covering fences, or hedges or for climbing on stumps of trees. They can also be trained on tall triangular frames in pots or containers. They are also good for sprawling and covering the rough slopes and banks. The dwarf and compact varieties are ideally suited for window-boxes, edgings, borders and pots. The semi-tall nasturtium is also useful as ground cover. The cut flowers along with their attractive foliage are commonly used in flower arrangements.

The seeds are sown directly in permanent beds where the plants are to flower and the seedlings thinned out to about

Plate V—Nasturtium (*See page* 147)

Plate VI—Verbena

(*See page* 150)

Plate VII—Salvia (*See page* 163)

Plate VIII—Gerbera (Double)

(*See page* 196)

25-30 cm apart. The sowing is done in September-October in the plains and in March-April in the hills. The plants flower after about 2½ to 3 months of sowing. A light and dry soil and a sunny situation are ideal for nasturtiums. They do not require heavy manuring as it encourages foliage growth; resulting in poor flowering. When grown in the shade, the plants tend to develop more leaves and produce fewer blooms than when planted in a sunny situation.

JEWEL OF THE VELDT

Ursinia anethoides

FAMILY: Compositae *ORIGIN:* South Africa

The plants are about 35-45 cm high and bushy with dark green deeply-cut foliage. The flowers are daisy-like and brilliant orange with crimson purple centres borne on long thin stems. The plants are very free-flowering.

The two other popular species are *U. pulchra,* 25 cm high with bright orange flowers and *U. pygmaea,* 15 cm high, with deep orange blooms. The well-known varieties are the Aurora Golden Bedder (25 cm high, golden orange flowers with deeper orange centre) and Ursinia Hybrids (orange and yellow shades).

The seeds are sown directly at permanent sites where the plants are to flower. The seedlings are thinned out 25 cm apart. In the plains, the sowing is done in September-October, while in the hills it is done in March-April. The flowering begins after about 3 to 3½ months of sowing. The plants thrive well in a rich and well-drained soil and a sunny location.

NAMAQUALAND DAISY

Venidium fastuosum

FAMILY: Compositae *ORIGIN:* South Africa

This is a very free-flowering annual, about 60-90 cm tall and bushy, with long irregularly-lobed leaves. The foliage and flower buds with silvery-white hairs have a wooly or furry appearance. The flowers are large, about 10 cm across, daisy-like and brilliant orange with a purple-black zone and shiny black centres, borne on long stems. Several *V. fastuosum* Hybrids having ivory, cream, yellow and straw-coloured flowers with shiny black discs and maroon zones are also available. Besides these, there are the hybrids of crosses between the two species, *V. calendulaceum* and *V. fastuosum,* known as Sutton's Dwarf Hybrids, about 35-45 cm high with rich orange bloom having a crimson zone.

Venidium is excellent for cut flowers, beds and borders. The seeds are sown in September-October in the plains and in March-April in the hills. The seedlings are transplanted later into permanent beds. The flowering starts after 3 to 3½ months of sowing. The plants require a light and well-drained soil and a sunny situation.

VERBENA

Verbena x hybrida

FAMILY: Verbenaceae *ORIGIN:* South Africa

Although Verbena is a perennial, it is commonly grown as an annual in the gardens. The plants are about 20-30 cm high with large dark green or grey-green leaves having toothed margins. The star-like flowers are borne in flat compact clusters held well above the foliage. The flowers are brilliant blue, lavender, deep violet, pink, rose, lilac, mauve, red, purple, cream or white, many with contrasting colours. The blooms are delightfully scented, particularly in the Large-Flowered Blue.

Verbena can be grown effectively for beds and cut flowers. The dwarf compact varieties are useful for window-boxes, edgings, rock gardens and pots. They are also used for hanging-baskets.

The important Mammoth or Large-Flowered varieties are Candidissima (white), Lavender Glory, Beauty of Oxford Hybrids, Defiance (scarlet), Pink Shades, Royal Blue and Grandiflora Mixed. The dwarf compact varieties include the Crystal (white), Dannebrog (scarlet with a white eye), Defiance (bright scarlet), Salmon Queen (salmon pink), Sparkle (scarlet with a white eye), Splendour (purple with a white eye), Starlight (blue with a white eye) and Sparkle Hybrids. There are also the Royal Bouquet Mixed, the Multiflora Verbenas and the Rainbow Mixture (early, dwarf and erect). Recently, a double-flowered salmon-pink variety, Miss Susie, has been evolved which has extra ruffled petals in the centre. A new variety, Calypso, produces attractive flowers which are boldly striped in contrasting colours, like white stripes on red, lavender on purple, light pink on deep rose and pink on white.

The seeds are sown in September-October and from March to June in those areas which have a low rainfall with cool temperatures. In the hills, the sowing can be done in March-April. The seedlings are transplanted into beds after about a month of sowing. The plants flower after about three months of sowing and continue to bloom for a long time. They thrive best in a light and well-manured soil and a sunny location.

Verbena erinoides, the Moss Verbena, is a perennial species commonly grown in gardens. The plants are low-growing and spreading in habit with finely-cut foliage. The flowers are white, mauve or pink in colour and resemble those of the common verbena. The flowering takes place during summer. It is suitable for growing in rock gardens and hanging-baskets or for ground cover.

PANSY

Viola tricolor hortensis

Other common names: Viola, Tufted Pansy

FAMILY: Violaceae *ORIGIN: Southern France* (Viola)

Pansy *(Viola tricolor hortensis)* is an all-time favourite. It is a perennial but is usually treated as an annual in the plains and as a biennial in the hills. The plants are low-growing (20-25 cm), compact and trailing, having long leaves with cut edges. The flowers have a wide range of colour including the different shades of blue, purple, red, bronze, yellow, primrose, cream, orange, pink, rose, apricot, salmon-pink, wine-red, black or white, many beautifully marked, striped or "pencilled", blotched, veined, margined or variegated in contrasting colours with wavy and crinkled edges. In some varieties the flowers look like little cat faces with dark pencilled markings resembling whiskers. The flower size varies considerably in different varieties and in large-flowered or giant varieties, the flowers measure upto 10-15 cm across. The flowers are sweetly scented, particularly in the early morning.

The important large-flowered or giant-size pansies are the Swiss Giants, Roggli's Swiss Giants, Engelman's Giants, Steele's Jumbo, Elli's Oregon Giants (ruffled), Thor Giants, Masterpiece or Germania, Arcadia Mixed (Pastel shades), Maple-leaf Super Giants, Reads' New Century Hollander Giant, Aalsmeer Giants, Floradale Giants, Westland Giant Scented (large, sweetly scented) and Super French Giants. The flowers in these varieties may be as large as 10-15 cm across. The other popular varieties are the Trimardeau Bedding with compact and free-flowering plants and large flowers, and Butterfly Hybrids with ruffled or fluted petals, marked and blotched with sheen and metallic tones, and Felix or Queen Alexandrine with flowers 'pencilled' like the cat's whiskers. There are also the Clear Crystals in which the flowers are of clear sparkling colours without blotches or markings. The vigorous, uniform, free-flowering and large-flowered, F_1 hybrid pansies like the Mammoth White F_2 and Colour Blend and the F_2 hybrids like the Colour Carnival (Swiss Giant type) and Masquerade (Oregon Jumbo type) are also well-known.

For edgings, beds, borders, rock gardens, pots and window-boxes, the pansies are invaluable. They can also be grown effectively under shrubs or trees as they thrive well under partial shade and also for covering the ground under standard roses or in bulb beds. The cut flowers are suitable for decoration and last for three or four days in water.

The seeds are sown in September-October and the seedlings transplanted at the four-leaf stage. In the hills, sowing can be done in August-September or March-April. Pricking the seedlings is useful in obtaining sturdy plants. The seedlings are best transplanted when they are 5-7.5 cm tall. The plants are pinched back to make them bushy, otherwise they may become leggy. The flowering commences after 3½ to 4 months of sowing. The plants thrive best in a light, well-drained and richly-manured soil and a sunny or semi-shaded situation. It is beneficial to enrich the soil with cowdung manure and leafmould and to water the plants at regular intervals to prevent the plants from drying out. Frequent hoeing and weeding are necessary. Application of a liquid manure once a fortnight is also useful, particularly during flowering. The faded flowers should be removed frequently to encourage more flowering.

VIOLA

Viola cornuta

The viola or tufted pansy has originated from the species *Viola cornuta.* The flowers of viola are usually 2.5-5 cm across as those of pansies and are self-coloured and the plants are more tufted and compact in habit. The flowers are blue, yellow, apricot, ruby, violet-blue or white and are borne on short stems.

There are several good varieties like Blue Gem, Blue Perfection, Admiration, Arkwright, Ruby, Chantreyland, Early Spring and Henry King. There is also the F_2 hybrid, Toyland, in a mixture of bright gay colours.

Viola is particularly useful for edgings, window-boxes, rock gardens and hanging-baskets. It can also be grown in beds, borders and pots. Viola and Sweet Alyssum make an attractive combination for edgings.

Its culture is very similar to that of the pansies. It can also grow successfully in partial shade.

ZINNIA

Zinnia elegans

Other common name: Youth and Old Age

FAMILY: Compositae *ORIGIN* :Mexico

With its wide range of flower colours and sizes, the Zinnia *(Z. elegans)* is a popular flower for summer and the rainy season. During the last 50 years, much improvement has been done in the U.S.A. where it has become very popular.

As a result of breeding, several varieties differing in their plant height and shape, size and colour of flowers have been evolved. The height of the plant varies from 15-90 cm; the tall varieties are 75-90 cm, intermediate 45-60 cm, and dwarf 15-45 cm. The leaves are oval in shape and rough-textured. The size of flowers which may be single, semi-double or double, ranges from 2.5-15 cm across and the vivid flower colours are white, cream, yellow, lemon, primrose, purple, scarlet, crimson, red, rose, orange, maroon, chocolate, lilac, lavender, magenta, mauve, salmon or violet. The ray petals may be flat,quilled, ruffled or shaggy.

There are numerous varieties of Zinnia. The most common types are as follows:

Tall Varieties : 75-90 cm

Giant Dahlia flowered: 13 cm large and 5 cm deep double flowers borne on long stems. Canary Bird(yellow), Crimson Monarch, Dream (lilac), Exquisite (dark rose), Illumination (salmon-red), Meteor (dark red), Oriole (orange-scarlet), Polar Bear (white), Purple Prince and Scarlet Flame (scarlet).

Giants of California: 13-15 cm across double flowers, a little more flattened with overlapping and more loosely placed petals than in the Dahlia-flowered type. Brightness (Pink), Cherry Queen (rose), Daffodil (canary yellow), Golden Queen (yellow), Lavender Gem (lavender), Miss Willmott (light pink), Orange King (orange-scarlet), Orange Queen (golden orange), Pink Lady (bi-coloured cream and buff with a pink centre), Purity (white), Salmon Queen, Scarlet Queen and Violet Queen.

Super Giants: These are flowers 14-15 cm across in various shades, many with two-or-three tone colour effects.

Medium-tall Varieties — 45-60 cm

Burpeeana Giant or Giant Cactus—Flowered or Chrysanthemum—Flowered: Large flowers with quilled, ruffled or shaggy petals borne on long and strong stems. Empress (rose-pink), Red Man (scarlet), Snow Man (white), Sun God (light yellow) and Mixed. The plants are 61 cm tall.

Cut and Come Again or Dwarf Pumila: Medium-sized (6-8 cm) flowers, fully double, well-rounded and compact and early-blooming. Pink Beauty, Salmon Rose, Bright Scarlet, Canary Yellow, White and Mixed. The plants are 45-60 cm tall.

Fantasy: Cactus-flowered, 8-9 cm across. The plants are 61 cm tall.

Dwarf Giant: "Miss Universe". Huge flowers 15-18 cm fully double, self-and bi-coloured. The plants are 60 cm tall.

Gaillardis-Flowered or Navajo: The flowers resemble a double gaillardia, bi-coloured, narrow petals tipped white, cream or yellow, 45-60 cm tall. The latest variety is Pinwheel.

Scabiosa-Flowered: The flowers are scabiosa-like with pincushion centres and are 60-75 cm tall.

Peppermint Stick: The flowers are the pumila type, 4-5 cm across, striped and mottled in bright colours like red and white or purple and white, and are 60 cm tall.

Ortho-Polka: Flowers like Peppermint Stick but are larger in size 8-9 cm across and are 60 cm tall.

Gracillima "Red Riding Hood": These are miniature, double, deep scarlet flowers, are 45 cm tall.

Dwarf Varieties—15-45 cm

Lilliput or Pompon or Baby: Small, 2.5-4 cm across double flowers, free-flowering, 30-45 cm tall and bushy. Peach Blossom, Rose Gem, Scarlet Gem, Canary Yellow, White Gem and Mixed.

Cupid: Small button-like flowers, 30 cm tall. Goblin (burnt orange), Pixie (yellow), Snowdrop (white), Tiny Tim (scarlet), Pink Buttons, Red Buttons and Mixed.

Miniature "Sugar'n Spice": Small double flowers, white, yellow, orange or red, are 25-35 cm tall.

Tom Thumb: Flowers small, lilliput-type, very dwarf; are 15-20 cm tall.

Thumbelina: Double or semi-double small flowers, 3-4 cm across, white, yellow, pink, lavender, orange or scarlet, extra dwarf 15 cm tall, very bushy, compact, floriferous and early-flowering.

Persian Carpet. Z angustifolia (Z. haageana or *Z. mexicana):* Miniature (4 cm) double flowers with pointed petals tipped or bordered with a contrasting colour giving a multicolour effect; are 30 cm tall.

Old Mexico (Z. angustifolia): A tetraploid variety with 6 cm across double flowers, deep mahogany-red edged with bright gold; 35-40 cm tall.

Gold Tip (Z. angustifolia): Small (7 cm)flowers, dark mahogany red edged with bright golden yellow; 35 cm tall.

Haageana or Mexican Hybrids (Z. angustifolia): Small, single or double bi-coloured flowers; 30 cm tall.

Linearis (Z. linearis): Perennial zinnia, with small single flowers of golden orange or white with dark centres and with light lemon stripes; 20-25 cm tall, early-flowering within six weeks from the date of sowing.

Apache Snowflakes (Z. crassula pumila): Small (2 cm) single, bright snow-white flowers, profuse flowering; 15-20 cm tall.

Other Varieties

Burpeeana Gaint Hybrids: Includes both F_1 and F_2 Hybrids, large (12.5 cm) ruffled flowers, 75-90 cm tall. Apricot, Blaze (orange-scarlet), Eskimo (creamy white), Glamour Girls (pastel shades), Riverside Beauty (coral). Rosie o' Grandy (light rose), Sunny Boy (deep yellow), Cherry Time (cherry-rose), Treasure Island (deep yellow, pink and orange) and Mixed.

F_1 Hybrids *(Zenith Zinnias):* Cactus-flowered, 14-15 cm across flowers, vigorous, free-flowering, 60 cm tall. Bonanza (golden orange), Firecracker (red), Princess (salmon-pink), Yellow Zenith (yellow) and Zenith Mixed. Also Trail Blazer (deep red, medium-sized).

Tetraploids: Large (15 cm) flowers, strong stems, 60-75 cm tall. Shades of Rose (dahlia-flowered type), State Fair (mixed colours) and Burpee's New Gigantea Zinnias (mixed colours). Also Old Mexico (Persian Carpet type, multicoloured Mexican zinnia).

Zinnias are suitable for beds, borders, and pots. The dwarf varieties are ideal for window-boxes, edgings and beds. The cut flowers are commonly used in flower arrangements.

The seeds can be sown from February-March to August-September in the plains. Early and late sowings are usually preferable in the northern plains as these are less affected by the leaf-curl virus disease. The seedlings are transplanted at the four-leaf stage. Seeds can also be sown directly at permanent sites where the plants are to flower. In the hills, the seeds are sown in March-April. The seedlings should be pinched back at the time of appearance of the flower buds to make the plants bushy. After about 20 to 30 days of transplanting, a top dressing of 50 gm of ammonium sulphate and 30 gm of potassium sulphate per square metre may be applied to ensure better growth and large flowers. The plants thrive best in light and medium loam soils rich in organic matter and a sunny situation. They require frequent and heavy watering.

Zinnias are badly affected by the leaf-curl virus disease which occurs commonly in the northern plains. This disease does not appear in the hills. The affected plants must be removed as soon as they are detected. Early sowing in February-March or late sowing in August-September is helpful as the incidence of the virus disease is slight during these periods. *Zinnia linearis* is resistant to the virus disease and the Persian Carpet is usually unaffected. The other diseases are wilt and powdery mildew; the former which is soil-borne can be controlled by rotation of beds or sites of planting, while the latter may be effectively controlled by dusting sulphur. Generally, there is no damage from insect pests.

ANNUAL CLIMBERS

Both for utility and beauty, the annual climbers with their varying forms of growth habit, size and colour of flowers and time of flowering have become indispensable in the garden. All of them can be grown from seeds. Since many of the climbers are suitable for growing in pots, they are ideal for terrace-gardens and window-boxes, decoration of balconies or flats, framing of windows or doors and trailing on walls, trellis, pergolas, arches, pillars and poles.

Though their effect is usually temporary, their exquisite flowers, quick growth and profusion of blooming make them worthwhile for adoption. By growing them, one can have a variety of forms and colours in different seasons. They provide a spectacular display of flowers. Some of the important annual climbers which can be successfully grown are described below.

Morning Glory (Fam. *Convolvulaceae)* The most commonly grown annual climber is the Morning Glory, botanically known as Pharbitis purpurea and *P. tricolor* or *Convolvulus major* and *Ipomoea rubrocaerulea,* respectively. These are natives of tropical America and can twine up to 25 cm. They are quick-growing and in about two to two and a half months they start flowering. Their flowers are funnel-shaped, 8-15 cm across, and of varying colours like blue, scarlet, purple and white. They flower in the morning and fade out by the afternoon. The important varieties are Heavenly Blue (sky-blue flowers), Scarlet O'Hara (wine-red), Cornell (rosy crimson, white-edged), Pearly Gates (white), Darling (dark purple), Flying Saucers (very light blue with blue streaks) and others. There are also the double-flowered varieties (flore-pleno) like Rose Marie (deep pink) and Double White . They can be sown in early July and flower in winter.

Japanese Morning Glory (Fam. *Convolvulaceae)*—The Morning Glory seems to have reached its perfection in Japan where numerous attractively-coloured and large-flowered varieties have been developed. The Japanese Morning Glory *(Pharbitis x imperialis)* is a probable hybrid between the two species, *P. hederacea* and *P. tricolor.* This is a tall-growing climber with as large as 25 cm flowers and can be grown in pots if it is pruned into a bush. It can also be sown in July with other Morning Glory varieties.

Quamoclit (Fam. *Convolvulaceae)*—These include four important creepers. The Star Ipomoea *(Quamoclit coccinea)* has slender pointed leaves and fragrant scarlet flowers with yellow throats. *Mina lobata (Q. lobata)* is a vigorous climber with three-lobed leaves and upright sprays of onesided bright crimson flowers which change to orange and then to yellow. The Cypress Vine *(Q. pinnata)* is a light creeper having fern-like leaves and small narrow trumpet-shaped scarlet or white flowers. The Cardinal creeper *(Q. sloteria)* has dark green finely-cut foilage and produces small funnel-shaped scarlet blooms with white throats. The Quamoclits can be grown in July-August and they flower during winter.

Moon Flower *(Calonyction aculeatum)* Fam. *Convolvulaceae*—This is a heavy climber with milky juice and large heart-shaped leaves. The flowers are large, white, fragrant and trumpet-shaped which open in the evening or night and close in the morning. When sown in July-August, they come into bloom in winter and the same plants when left in the ground will start flowering at the end of May or early June. A blue-flowered variety, Bona-nox, is also grown.

Mussel-shell Creeper *(Clitoria ternatea)* Fam. *Leguminosae*—The flowers are like butterflies, usually deep blue and white in colour. It is a native of India. Sowing of seeds can be done in July-August to get blooms in winter.

Cobaea *(Cobaea scandens)* Fam. *Polemoniaceae*—This is an attractive climber with glossy foliage and large greenish-white or purple bell-shaped flowers. It can be sown in September-October and will flower in March-April. Sometimes this may take a year to do so.

Maurandia *(Maurandia barclayana)* Fam. *Scrophulariaceae*—This is a light climber well suited for growing in pots and produces antirrhinum-like flowers of purple and pink colours almost throughout the year. The seeds may be sown in September-October and the plants will flower about three months thereafter.

Thunbergia (Fam. *Acanthaceae)*—The two important annual climbing species are the Black-eyed Susan, *Thunbergia alata,* having yellow, orange, buff or white flowers, sometimes with a black eye and T. fragrans with white but not fragrant flowers. The former is ideal for growing in window-boxes, hanging baskets and pots.

Canary Creeper *(Tropaeolum peregrinum)* Fam. *Tropaeolaceae*—This is related to the common nasturtium. It produces finely-cut leaves and beautifully fringed canary-yellow flowers and can grow well in semi-shade. The seeds can be sown in September-October. It will flower during February-March.

Nasturtium *(Tropaeolum majus)* Fam. *Tropaeolaceae*—The tall single-flowered nasturtiums are also used as climbers. They are best grown in window-boxes. The double-flowered variety, Gleam, also has a semi-trailing habit. They can also be sown in September-October to obtain blooms in February-March.

Sweet Pea *(Lathyrus odoratus)* Fam. *Leguminosae*—The ever-popular sweet pea is ideal for providing a temporary screen. Its fragrant and pastel-coloured flowers of various hues are most enchanting. It does not grow well in pots. The best time to sow the sweet pea is from mid-September to the first week of October.

HERBACEOUS PERENNIALS

Of the several herbaceous perennials, only a few can be successfully grown on the plains of our country. However, under the temperate climate of the hills several other perennials grow exceedingly well and survive for a long time. The important and beautiful herbaceous perennials suitable for growing on the plains and on the hills are described below.

Perennials for the Plains

Angelonia grandiflora (Scrophulariaceae)–It is a dwarf perennial, growing about 60 cm high and producing deep blue or mauve flowers. There is also a white-flowered species. It can be easily propagated by cuttings in the rains. It is commonly grown in pots.

Aster amellus and *A. novae-belgii (Compositae)*–Michaelmas Daisy : Michaelmas Daisy belongs to three species, namely, *A. novae-belgii, A. novae-angliae* and *A. amellus.* The plants of *A. novae-belgii* are about 60-90 cm tall and produce small daisy-like flowers in profusion during summer and the rainy season. The flowers are deep blue, mauve, lavender, pink or white in colour. There are several varieties in each colour. The plants of *A. amellus* are also about 60-90 cm high with light and deep blue, mauve and pink flowers. The plants can be propagated by division of roots during the rainy season. There are several varieties under each of these three species.

Coreopsis (Compositae)–The three commonly grown perennial species of Coreopsis are *C. grandiflora, C. lanceolata* and *C. verticillata,* all of which produce daisy-like yellow or golden-coloured flowers. The species *C. verticillata* has starry flowers of golden colour and its variety, *C. v. grandi-*

Plate IX—Gladiolus (*See page* 197)

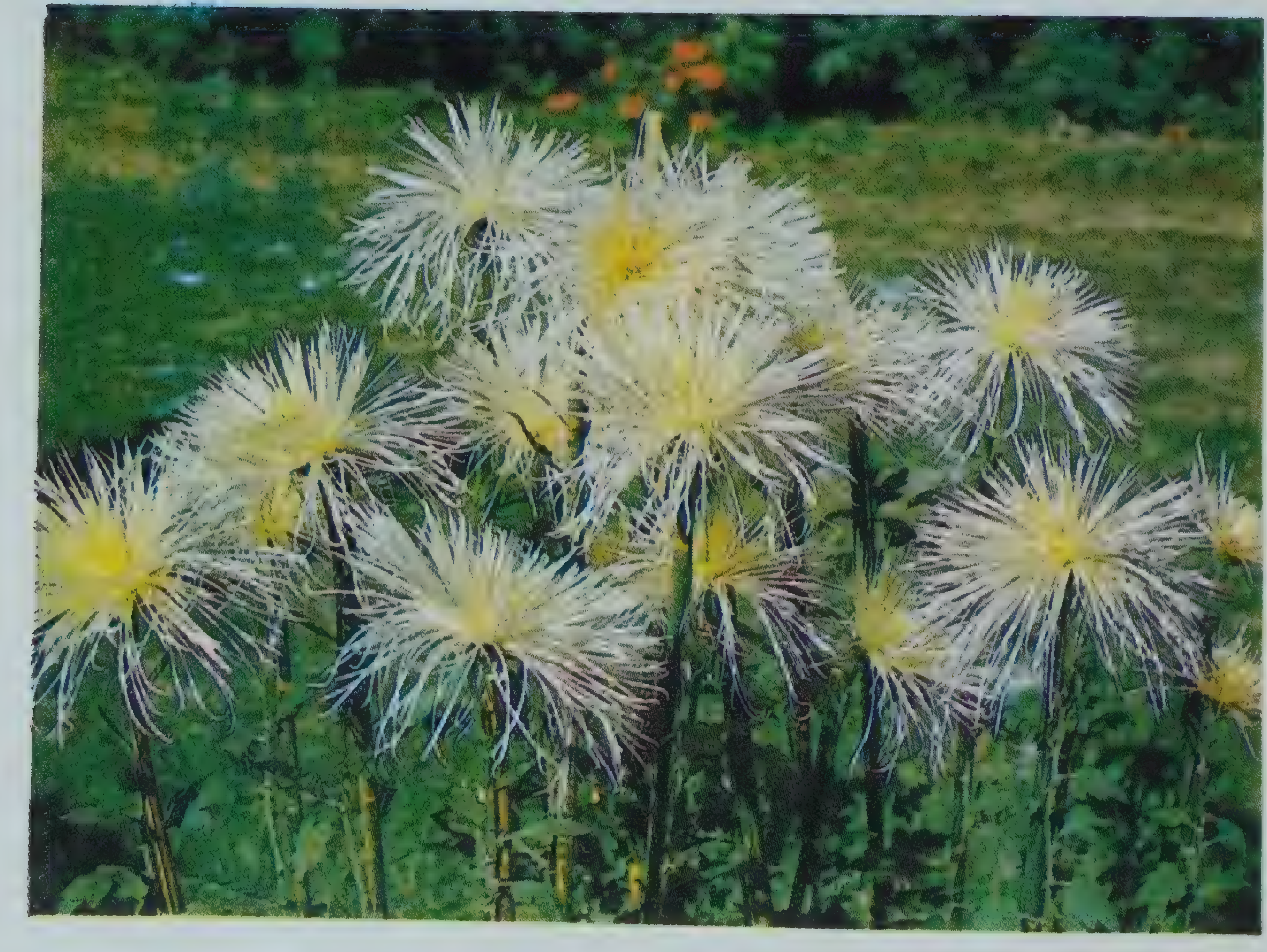

Plate X—Chrysanthemum

(*See page* 245)

Plate XI—Geranium (*See page* 250)

Plate XII—A Group of Annual Flowers

Plate XIII—Roses (*See page* 258)

flora, is taller with deeper yellow-coloured flowers. The species *C. lanceolata* has similar flowers as those of *C. grandiflora* but the plants are dwarfer. These perennial Coreopsis species flower during summer and can be propagated from seeds or by division of roots.

Gaillardia (Fam. *Compositae)* (Also known as Blanket Flower)—This is a herbaceous perennial which is best grown as an annual on the plains but on the hills it is a common perennial. The description of Gaillardia has already been presented under the Annuals. The perennial plants can be propagated by division of roots, root cuttings and seeds.

Impatiens sultani and *I. holstii* (Fam. *Balsaminaceae)* (Perennial Balsam)—These have been mentioned under Balsam *(Impatiens* species) in the description of the Annuals.

Mirabilis jalpa (Nyctaginaceae)—Its description has been given under the Annuals.

Phlox decussata (P. paniculata) (Fam. *Polemoniaceae)*—Border Phlox: The plants are about 45-120 cm tall with lance-shaped leaves. The flowers are like those of the common Phlox and range in colour from white to crimson including scarlet, purple, violet, mauve, pink and red and many have dark eyes. The flowering takes place in summer.

The plants thrive best on the hills. They require a light, well-drained and rich soil. They are suitable for growing in pots and borders. They can be propagated by root or top cuttings and from seeds.

Portulaca (Portulaceae)—This is a perennial type with bright deep rose-coloured double flowers. It can be grown in the same way as the other annual varieties of Portulaca. The plants are propagated by division, stem cuttings or seeds.

Salvia (Labiatae)—Though salvia is usually grown as an annual, it can also be treated as a perennial. It has been described under the Annuals.

Solidago canadensis (Fam. *Compositae)* (Golden Rod)—The plants are tall (1-2 m) with oval, pointed leaves and feather-like golden-coloured terminal panicles. The flowering is in early October on the northern plains, while on the hills it flowers during summer. There are some dwarf-growing species also. The plants can be propagated by division and from seeds.

Verbena erinoides (Fam. *Verbenaceae)* (Moss Verbena)—It has been described under Verbena.

Vinca rosea and *V. alba* (Fam. *Apocynaceae)* (Periwinkle)—The plants are about 60 cm tall with bright green smooth oval leaves. The flowers are round and flat with an eye in the centre and their colour may be rose *(V.rosea)*, white *(V. alba)* or white with a red eye in the centre. The flowering is profuse during summer and the rainy season. The other species *V. major* with larger rose-coloured flowers grows best on the hills only. The plants are propagated from seeds or by stem-cuttings.

Viola odorata (Fam. *Violaceae)* (Sweet-scented Violet)—Violet is much prized for its sweet-scented flowers. The plants are trailing in habit with round leaves and produce small white, blue or purple-coloured single or double flowers. It grows better in partial shade than in full sunshine. The plants can be propagated by division of roots. They need protection during the summer months. The division can be done in September-October on the plains. The plants thrive best on the hills or at high elevations with a cool climate.

Zinnia linearis (Compositae)—Its description has been presented under Zinnia.

Perennials for the Hills

Besides the perennials mentioned above the plains, several others can also be successfully grown on the hills. A few important perennials for the hills are described below.

Achillea (Yarrow, Milfoil) (Fam. *Compositae)*–The most commonly grown species is *Achillea filipendulina (A. eupatorium).* The plants are as tall as 1.5 m with green finely-cut pungent foliage. The large flat heads of flowers are deep yellow in colour. There is another species *A. millefolium* which produces flat heads of white flowers. The plants are propagated by division.

Anchusa italica (Fam. *Boraginaceae)*–It is described under Anchusa.

Aquilegia vulgaris (Columbine) (Fam. *Ranunculaceae)*–The common Columbine is *Aquilegia vulgaris.* The recent hybrids *(A.x cultorum)* have arisen from crosses between different species. The plants forming compact clumps have fern-like foilage with three leaflets in each leaf. The flowers are about 5 cm across and cup-shaped with a long spur. The colour of flowers may be blue, lavender, red, yellow, golden, pink, crimson or white. The flowering is in summer. The plants are raised from seeds in March-April. It can be grown massed in front of a border. The plants thrive well in partial shade.

Bergenia cordifolia (Elephant Ear) (Fam. *Saxifragaceae)*–The plants are low-growing with large dark green heart-shaped glossy leaves. The flowers are small (about 2 cm across) borne on medium-long stalks above the foliage. The flower colour is rose-pink. The plants are propagated by division of roots or from seeds. Another species, *B. ligulata,* a native of the Himalayas, is also worth growing in the garden. Its flowers are also pink or white but they flower during early spring. They are suitable for growing in rock gardens and pots.

Campanula (Bellflower) (Fam. *Campanulaceae)*–The plants bear cup-and-saucer-shaped flowers of blue, lavender, purple or white. The commonly-grown perennial species are *C. carpatica* (blue and white), *C. burghaltii* (lavender), *C. glomerata* (deep purple), *C. latifolia* (violet-purple, white, pale mauve), *C. lactiflora* (lavender), *C. latiloba (C. grandis)* (blue or white) and *C. persicifolia* (lavender or white, single or double). They are suitable for growing in borders. The flowering is in late summer. The plants thrive best in a well-drained soil and full sunshine. They can be propagated by division of roots in spring or from seeds.

Chrysanthemum maximum (Shasta Daisy or Moon Daisy) (Fam. *Compositae)–The* plants are about 60-90 cm tall with toothed leaves. The flowers are large, daisy-like and white with a yellow central disc. The plants grow best in a well-drained soil and a sunny situation. They are ideal for growing in borders and for cut flowers. The flowering is during summer. The plants are propagated by division of roots and from seeds.

Delphinium (Fam. *Ranunculaceae)*–The description is given under *Delphinium hybridum.*

Digitalis purpurea (Foxglove) (Fam. *Scrophulariaceae)*– It is described under the Annuals.

Gypsophila paniculata (Fam. *Caryophyllaceae)–It* is mentioned under *G. elegans* in the Annuals.

Linum perenne (Fam. *Linaceae)*–The description is given under *Linum grandiflorum.*

Lupinus (Lupins) (Fam. *Leguminosae)*–It is described under the Annuals.

Oenothera (Fam. *Onagraceae)*–It is mentioned under the Annuals.

Paeonies Fam. *(Ranunculaceae)*–There are both herbaceous and shrubby Paeonies. The commonly-grown species are *P. officinale* with double flowers of red (*rubra plena*), white*(alba plena)* and pink *(rosea plena)*, *P. lactiflora* (double, white, crimson, pink, lilac-rose and red), *P. mlokosewitschi* (yellow) and *P. wittmanniana* (pale yellow). The Tree Paeony is known as *P. suffruticosa (P. moutan).* They are best for growing in beds, borders and shrubberies. The flowers are excellent for cutting. The plants grow well in a rich, well-drained soil and a sunny situation. They are propagated by division in September-October. The flowering is in summer. The plants can also be raised from seeds but they take a much longer time, usually 6 to 8 years to come into flowering.

Penstemon barbatus (Fam. *Scrophulariaceae)*–Its description is presented under the Annuals.

Primula (Fam. *Primulaceae)*–It is mentioned under the Annuals.

Pyrethrum roseum (Chrysanthemum coccineum) (Fam. *Compositae)*–The plants are about 60-90 cm tall with finely-cut leaves and large daisy-like flowers of white, rose, red or lilac. The recent hybrid garden varieties are single-or double-flowered of various shades of pink, red, scarlet, crimson, salmon and other hues. The single flowers have a cream, yellow or orange-coloured disc in the centre. The flowering is in summer. They are suitable for growing in borders andfor cut flowers. The plants thrive well in a rich, well-drained and moist soil. They are propagated by division or from seeds.

Rudbeckia (Fam. *Compositae)*–It is mentioned under the Annuals.

BULBOUS FLOWERS

ACHIMENE

Achimene longiflora

Other common names: Magic Flower, Widow's Tears, Nut Orchids

FAMILY: Gesneriaceae *ORIGIN:* Guatemala, Mexico

Achimene is a small (20-30 cm high) plant with green glossy leaves and exquisite petunia-like waxy, long-keeping flowers in pale mauve, purple, white or grey-white, yellow, pink, scarlet carmine or red jewel-like colours. The plants flower profusely during the rainy season and remain in bloom from June to October or November.

The tubers are very small in size. They are planted in March and the potting mixture contains coconut fibre or moss, soil and sand. Since the plants have shallow roots, tubers can be planted in small shallow pans or pots with little soil. Sometimes a single tuber is put in a ball of moss and hung with strings from which the plants will come out and blossom. Usually three tubers are planted in a small-sized pot or pan and in larger pots five or ten tubers can be grown. Achimenes are generally grown in hanging-baskets. The plants need a sheltered and semi-shaded situation, plenty of water and a light soil with a good drainage for a satisfactory growth. After the rainy season when the flowering is over, the plants should no longer be watered. The dry pots are placed in a protected place till the next season (March) when the tubers may be repotted. The plants can also be propagated from terminal stem-cuttings. The cuttings are planted in sand and root easily during the rainy season. However, a better method is to raise the plants from tubers, as these are produced in abundance.

The important varieties are Cardinal Velvet, the double-flowered Coral Gem and Crimson Tiger, Petticoat Pink, Blue Skies, Sun-burst Flava, Gorgeous, Setting Sun, Coccinea (scarlet), Gloxiniflora (white) and Longiflora (rich purple).

SCENTED GLADIOLUS

Acidanthera bicolor var. *Murielae*

Other common name: Peacock Orchid

FAMILY : Iridaceae *ORIGIN :* Abyssinia

The plants are upright, 90 cm tall and have linear leaves. They resemble the common Gladiolus in form and habit. The flowers are 7.5-10 cm across, pure white with a star-shaped dark crimson-maroon blotch in the throat and are very sweet-scented. They are excellent for cut flowers. About 5 to 6 florets are produced on each stem. An early-flowering hybrid Tubergenii Zwanenburg is a new variety. Acidanthera has been crossed with gladiolus to develop scented varieties of the latter.

The corms are small and are planted 8 cm deep and 15 cm apart. The plants thrive best in a light, well-drained soil and a sunny and sheltered location. They require rich manuring, preferably well-rotten cowdung manure. The corms are planted from August to October in the plains and the plants flower early in winter and can continue to bloom till February-March. In the hills, the planting is done in March-April and the flowering starts in autumn.

BLUE AFRICAN LILY

Agapanthus umbellatus

Other common name: Lily-of the-Nile

FAMILY : Liliaceae *ORIGIN:* Cape Colony (Africa)

This is a tall plant, about 60-90 cm high, with long, thick,narrow and rich green foliage. The trumpet-shaped, small flowers about 2.5 cm across are borne in large umbels at the ends of long and thick leafless stems. The flowers may be pale or deep blue in colour. There is also a white-flowered variety.

Agapanthus grows well in the hills. Since it needs a cooler climate, it does not thrive well on the plains. It is suitable for growing in large tubs or pots and in the ground near a pool or by the waterside and in beds or borders. The flowers can be used for cuttings.

The bulbs are planted in March in the hills and the plants bloom in the rainy season, July-September. The bulbs are planted about 10 cm deep. The plants like a light, well-drained and richly-manured (leaf-mould or cowdung) soil and a sunny situation. They also need plenty of water and are heavy feeders.

ALLIUM

Allium

Other common names: Onion, Garlic

FAMILY: Amaryllidaceae *ORIGIN:* Northern Hemisphere
(temperate regions)

There are several species of Allium which are used for ornamental purposes. The common onion is also a species of Allium *(A. cepa).* The ornamental Allium species grow successfully on the hills. The important ornamental species are *A. albo-pilosum* (lilac, star-shaped flowers, 60 cm tall), *A. azureum*(sky-blue, 60 cm), *A. giganteum* (violet, rose-tinted, 1.5 m), *A. karataviense (pink,* 50 cm), *A. moly* (bright yellow, 25 cm), *A. nepolitanum* (white, 35 cm), and *A. ostrowskianum* (rose, dwarf 15 cm).

The plants are usually 60 cm or 1-2 m high in the tall varieties and 15-25 cm in the dwarf varieties. The flowers are small and borne in large globular or flat heads or umbels on long stems. They are rose, white, blue, lilac, purple, pink, yellow or violet in colour.

Alliums are useful for growing in borders, shrubberies or rock gardens. They are also planted for naturalizing. Cut blooms are ideal for decoration. The bulbs are planted 5-8 cm deep and 8-10 cm apart in October-November in the hills. The plants flower from May to October, depending upon the variety; most of the species bloom in May-June. They thrive best in a well-drained and light sandy and dry soil and a sunny situation.

AMARYLLIS

Amaryllis belladonna (Hippeastrum)

Other common name: Belladonna Lily

FAMILY: Amaryllidaceae ORIGIN: South Africa

Amaryllis is a very showy bulbous plant which thrives exceedingly well both in the plains and in the hills. The plants are about 61-90 cm tall with long, green, strap-shaped foliage. The large fragrant trumpet-shaped flowers are borne in large umbels or clusters at the ends of long stout stems. Usually

2 to 4 flowers are produced in each cluster. The flowers in the large-flowered varieties are produced in each cluster. The flowers in the large-flowered varieties are as large as 20-25 cm across, particularly in the Royal Dutch Hybrid Amaryllis (Hippeastrum). There are several varieties of Amaryllis including the small-flowered types having a large number of flowers (5 to 7) on a stalk and the large-flowered Dutch Hybrids with giant-sized (20-25 cm across) flowers in a small number (2 to 4) in a cluster. The colour of flowers may be white, dark red, scarlet red, crimson, deep pink, salmon, orange or white with red stripes or white stripes on solid colours.

Amaryllis is an attractive flower for cut blooms, beds, borders and pots. The bulbs are planted in September-October or December-January in the plains, preferably during the later period when the bulbs are dormant. In the hills, the planting can be done from October-November till March-April. While planting, the bulbs are usually kept one-third to one-half above soil and only one bulb is planted in a 15-cm pot. The plants require a rich well-manured soil, plenty of moisture and a sunny location for a good growth. They flower during March-April in the plains and from winter to summer in the hills, depending upon the time of planting. In the plains from October to December when the leaves start drying, watering should be withheld to facilitate the bulbs to rest. This is useful in obtaining quality blooms in summer. The watering can be restarted from December or January onwards to encourage the production of foliage. In a milder climate, the plants do not go to rest, particularly where the winter is not severely cold. In the hills, the watering is withheld in early winter and the dormant bulbs are stored in a cool place until December when they are replanted and watered. The pot-bound plants flower best and a pot which is more than 5 cm larger than the diameter of the bulb should not be used. The plants should be fed with a liquid manure once a week, during the period of active growth and flowering. They do not need any regular repotting. They are usually repotted after four or five years. However, every year before the growth starts, the top soil is removed and compost or organic manure replaced and later a liquid manure is applied to facilitate a vigorous plant growth.

WINDFLOWER

Anemone coronaria

Other common name: Poppy Anemones

FAMILY: Ranunculaceae *ORIGIN:* Southern Europe to Central Asia

Anemone is low-growing (15-20 cm) with lobed and irregularly-cut foliage. The poppy-like flowers are white, pink, crimson. purple, scarlet, mauve or blue and may be single or semi-double, many-zoned, self-coloured or with more than one colour.

The two important groups of varieties are the De Caen with single flowers and St. Brigid with semi-double blooms. The popular varieties of De Caen type are Hollandia (scarlet), Mr. Fokker (blue), the Bride (white) and Sylphide (mauve), while Lord Lieutenant (mauve), the Admiral (deep pink) and the Governor (scarlet) are the well-known varieties of the St. Brigid form.

Anemone is suitable for pots, borders, rock gardens and cut flowers. When planted in clumps of 12 or more, it presents a nice display. The plants are propagated from seeds, division and root cuttings. They are planted 5-8 cm deep and 10-15 cm apart in rows spaced 30-35 cm apart. The tubers should be soaked into water for about 48 hours before planting to ensure better germination. The plants thrive best in a sandy loam, richly manured and well-drained soil and a sunny as well as a semi-shaded situation. The best time to plant tubers is during October in the northern plains (U.P., Delhi and Punjab), where it grows well and in February-March or September-October in the hills. In the plains, the anemone flowers during February-March, while in the hills it blooms in spring or in late summer when planted in the autumn (September-October). After flowering, the tubers should be lifted from the ground and stored in a dry place.

Another species, *A. japonica,* with white or pale pink flowers, is also worth growing. However, it does not grow successfully in the plains.

BEGONIA

Begonia

FAMILY: Begoniaceae ORIGIN : : Semi-tropical and tropical countries except Australia

The three main types of Begonia are the tuberous- the rhizomatous- and the fibrous-rooted. The tuberous-rooted group includes the most exquisite large-flowered hybrids which have attractive single or double flowers in various colours like white, pink, red, yellow, cream, orange, scarlet or salmon with smooth, ruffled, wavy, frilled or crested petals. The large-flowered begonias may resemble roses (Rose Form), camellias (Camellia-Flowered), carnations (Carnation-Flowered) or daffodils (Daffodil Type). There is also a Picotee Double with a contrasting border of a different colour from that of the rest of the flower. In the Rose Bud Begonia, the young flowers resemble rose buds in shades of rose and pink. Besides these, there are the extremely free-flowering Multifloras which come in three sizes, namely, Multiflora, Multiflora Maxima and Multiflora Gigantea or Grandiflora. The Pendula or

Hanging Begonias with a drooping habit and profuse small double or semi-double flowers suitable for hanging-baskets are also included in the tuberous-rooted class.

The rhizomatous Begonia is the Rex Begonia *(Begonia rex)* which is a native of our country, found growing wild in Assam. The Rex Begonia is prized for its attractive foliage. The leaves are fan-shaped and lop-sided, hairy with toothed edges and silvery white or deep crimson with attractive and and intricate patterns. In some varieties the foliage has a glistening metallic sheen. The important varieties are the Glory of St. Albans (metallic red and silver), Axel Lange (satiny olive-green with a dark centre spotted with circular silver blotches), the Emperor (flushed crimson with silver overlaid in the centre), Helen Jeupel (dark and diadem type), Her Majesty (purplish red with a silver band), Peace (silver with a red sheen) Peacock (dark black-and-red tones) and Silver Queen (olive-green with a silver band).

The fibrous-rooted Begonias include the two best groups, namely, the Semperflorens group *(B. semperflorens)* and the Lorraine group. In the former, the plants are compact and bushy with bright green and glossy bronze waxy leaves having small clusters of shell-like flowers of various pleasing colours, such as pale to deep pink, salmon, red, orange and white borne on graceful long stems. In the Lorraine Begonias, the two important varieties are the Gloire de Lorraine and the Hybrid 'Solbakken' having deep salmon pink clusters of flowers. There are also F_1 hybrid Semperflorens like Andy and Pandy. A few Begonia species having fibrous roots are also well-known for their attractive foliage. Among these, the popular ones are *B. haageana* having hairy olive-green leaves that are red on the lower side with pale pink blossoms borne almost throughout the year, *B. metallica* which is tall with glossy olivegreen foliage having purple veins and red beneath with light pink flowers and *B. maculata* with long green leaves having large silver spots on the upper surface and red beneath. The species *B. masonia* (Iron Cross Begonia) has small rounded bright green leaves with a purplish cross in the centre. Its leaves resemble those of *B. rex* in shape.

The tuberous-rooted large-flowered *Begonias* do not grow well in the plains. They thrive exceedingly well in the hills where these are grown in a glass-house or on a sunny verandah. The rhizomatous Begonia Rex and the fibrous-rooted *B. semperflorens* and other species grow successfully in the plains. The Begonias should be grown in cool, semi-shaded, moist and humid conditions with plenty of water during the growing season. The giant-flowered hybrid Begonias can be multiplied from seeds, tubers or cuttings from tubers and the Pendula and Dwarf Multifloras from cuttings and tubers. The Rex Begonia is propagated from leaf-cuttings. The Semperflorens are mainly grown from seeds, while the Lorraines are propagated from tip cuttings. They require a light soil with rich organic manure or compost. Their growing tips should be pinched back occasionally to make them bushy. They grow best in partial shade and when pot-bound they flower early and require frequent and heavy watering. A good potting mixture contains equal parts of soil, sand, leaf-mould and cowdung manure. In the hills, the tubers are best planted in February-March and the plants flower during late summer and autumn. The rhizomatous- and fibrous-rooted Semperflorens and other Begonias can be planted in October-November in the northern plains and they flower during spring (February-March). Begonias respond well to frequent applications of liquid manure, at least once a fortnight, during the growing season.

Begonias are ideal for pots, beds, rock gardens and hanging baskets. They are also useful for growing indoors as house plants. Pendula Begonias can be grown effectively in hanging-baskets and window-boxes, while Semperflorens are commonly grown in rock gardens.

BLACKBERRY LILY

Belamcanda chinensis

Other common name: Leopard Flower

FAMILY : Iridaceae *ORIGIN :* China

The plants are about 60-90 cm tall with iris-like leaves and graceful sprays of 5 cm across showy orange flowers with crimson spots borne on long stems. The black seed clusters are ornamental from which it gets its popular name. There are also the Avalon Hybrids which produce yellow, red, golden, orange or apricot flowers, some of which are unspotted. The flowers are produced in the rainy season, August-September.

The rhizomes are planted about 2.5 cm deep in February-March in the plains and during October-November in the hills. The plants can also be propagated from seeds and division. They thrive well both in the sun and in partial shade and a rich well-drained soil. During the growing period, the plants respond well to applications of liquid manure.

It is useful for growing in shrubberies, pots and borders. When planted in clumps of three, the plants produce a good effect. They are suitable for hardy accents in the garden.

KAFFIR LILY

Clivia miniata

FAMILY: Amaryllidaceae *ORIGIN:* South Africa

This is an attractive evergreen bulbous flowering plant which grows well only in the hills. The plant has long strap-shaped green foliage and bears large umbels of orange-yellow or scarlet funnel-shaped flowers in summer. It is treated like Amaryllis. The bulb is planted about 5 cm deep in February-March in the hills.

The plant thrives well in both sunny and semi-shaded situations. It responds favourably to liquid manure feeding during summer.

Clivia is suitable for growing in pots. It is also useful as a house plant.

LILY-OF-THE-VALLEY

Convallaria majalis

FAMILY: Liliaceae *ORIGIN:* Asia and Europe

This is a dwarf (15 cm) plant with a creeping rootstock and lance-shaped leaves. The flowers are small, 0.60 cm across, bell-shaped, highly fragrant and white and borne in sprays of 10 to 20 flowers on a 15-20 cm-long stalk. The flowers are highly prized for their most pleasing fragrance. There is also a pink flowered variety and a rare variety with double flowers. It grows best on the hills but can also flower for one or two seasons in the northern plains.

Lily-of-the-valley is suitable for growing in pots, beds and rock gardens. It thrives well in shade, particularly under a tall tree. The flowers are commonly used for cutting because of their fine fragrance. The important varieties are the Fortins Giant and Berlin Giant.

The creeping rootstock is planted horizontally about 2.5 cm deep with the pips a little above the ground. The planting is done in September-October both in the hills and in the plains. In the hills, the plants flower during May-June, while in the plains they bloom in February-March. The plants respond well to liquid manure feeding during the growing sea-

Plate 10—Pansy (*See page* 152)

Plate 11—Zinnia—Dahlia-Flowered (*See page* 155)

Plate 12—Amaryllis (*See page* 173)

Plate 13—Freesia (*See page* 193)

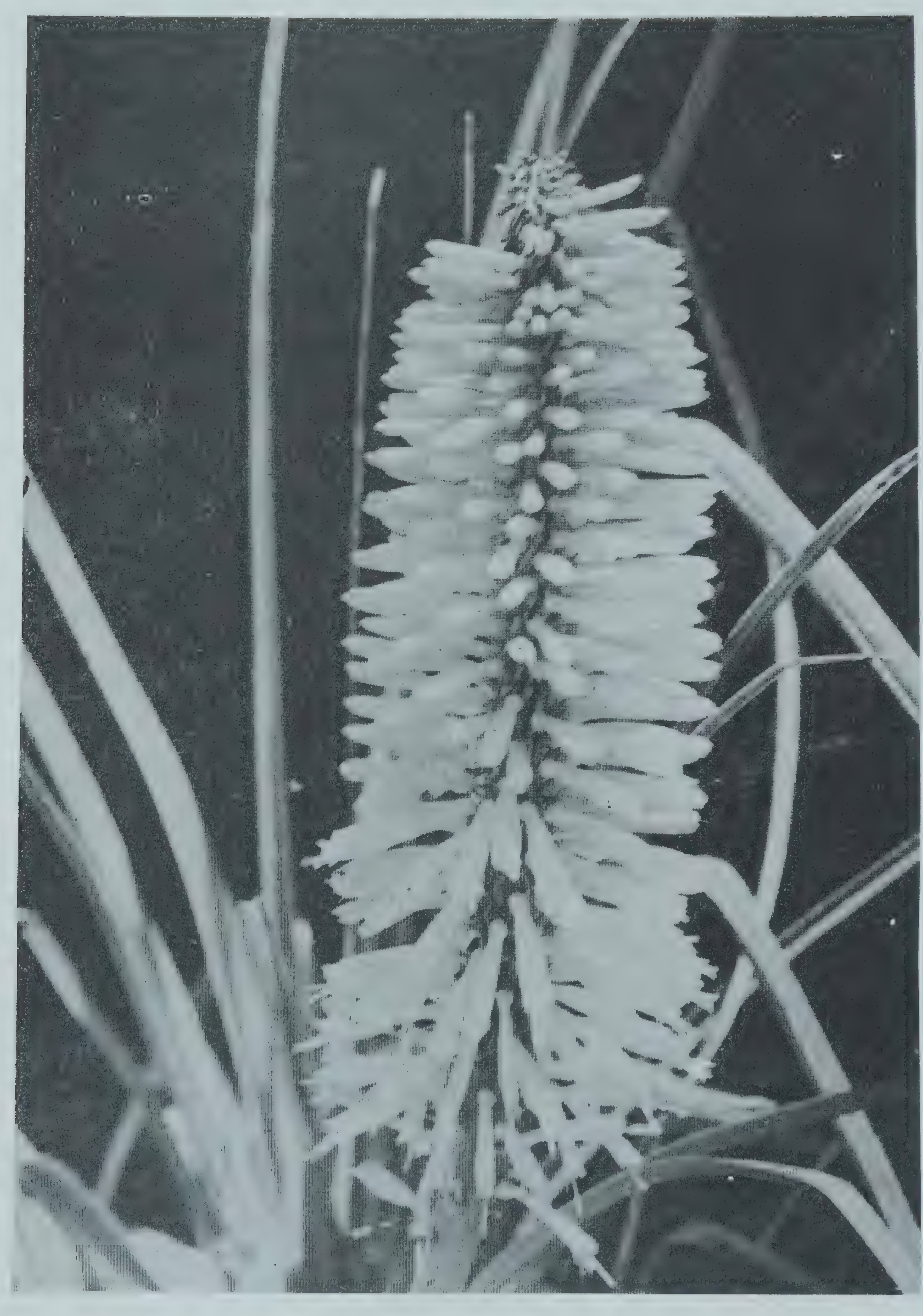

Plate 14—Red-Hot Poker—Torch Lily (*See page* 212)

son. They may require division of the rootstocks for further propagation in September-October, particularly when the clumps become overcrowded.

CRINUM

Crinum bulbispermum (C. longifolium)

Other common names: St. John's Lily, Cape Lily

FAMILY: Amaryllidaceae *ORIGIN:* South Africa

Crinum is a tall plant with large strap-shaped leaves. The flowers are large, funnel-shaped and borne in a cluster of 8 to 12 blooms in a scape. They are white-flushed red on the outside and are produced on long and stout stems. The plants flower during the rainy season in the plains and in summer in the hills. The other commonly grown species are *C. moorei* with pink flowers, C. *powelli* with pale pink blooms in summer, *C. zeylanicum* with attractive variegated foliage and *C. latifolium* with white flowers in summer.

It can be grown in pots, borders and along the edges of a pool. The plants thrive well in partial shade. The bulbs are planted in February-March both in the plains and in the hills. During that time, the bulbs can also be separated and repotted when the old plants have become overcrowded. The plants may be grown in a semi-shaded or a sunny-situation and require warm and moist conditions for best growth. They can remain in pots for four to five years without repotting.

CROCUS

Crocus spp.

Other common names: Saffron, *Kesar*

FAMILY: Iridaceae *ORIGIN:* Mediterranean region to South-west Asia

Crocus grows well only in the hills in our country. The most common species is *Crocus sativus kashmiriana,* the popular saffron which is widely cultivated in Kashmir. The plants are dwarf-growing with grass-like leaves and small (2.5-5 cm across), fragrant, violet-blue, rounded flowers borne on long slender stalks. The plants flower in autumn, September to December. There are three forms of the crocus, namely, the autumn-flowering (September-December), winter-flowering (December-February) and spring-flowering (March-April). The important autumn-flowering species are *C. sativus* (saffron, violet-blue), *C. longiflorus* (lavender with an orange-scarlet throat), *C. medius* (lilac-blue), *C. speciosus* (bright blue with violet veinings) and *C. zonatus* or *C. kotschyanus* (lavender with an orange interior base). Winter and spring flowering species are *C. aureus*(orange-yellow), *C. biflorus*(lilac, white with purple stripes, blue-purple stripes on a creamy white exterior, silvery-white or pure white), *C. chrysanthus* (yellow, blue, black, bronze or white),*C. dalmaticus* (rosy-lilac with a yellow throat), *C. imperati* (violet, buff or lilac), *C. olivieri* (rich orange-yellow), *C. sieberi* (lavender-blue), *C. stellaris*(orange-yellow with black lines on the outside), *C.susianus* (yellow with glossy brown stripes on the exterior). *C. tomasinianus* (pale sapphire-lavender with a silvery-white outside) and *C. versicolor picturatus* (white). The large Dutch Crocuses in several pleasing colours are hybrids between different species having large and attractive flowers produced in spring (March-April). The important varieties of this group are Jeanne d'Arc (white), Flower Record (blue-violet), Kathleen Parlow (white), Little Dorrit (silvery amethyst-blue), Negro Boy (blackish purple), Paulus Potter (dark ruby-purple), Peter Pan (white), Pickwick (pale silver-lilac with deep lilac stripes), Queen of the Blues (soft lavender), Remembrance (pale purple-blue), Striped Beauty (striped lilac) and Dutch Yellow Mammoth (Golden-yellow).

Crocus is suitable for pots, beds and rock gardens. It is ideal for naturalizing and for growing in clumps in the shrubbery, in the lawns or under small trees.

The bulbs are planted about 5 cm deep and 2.5 cm apart. The autumn-flowering forms can be planted in August or September, while the spring-flowering forms are planted in autumn (October-December). As the bulbs are often damaged by mice after planting it is better to soak them into water for a minute and then roll in red lead powder just before putting them into the soil or sprinkle a little amount of naphthalene over the area where the bulbs have been planted. The plants thrive best in a sunny location or in partial shade. The bulbs should not be lifted from the ground after flowering. However, after five or six years when they become overcrowded, they can be divided and replanted.

CYCLAMEN

Cyclamen persicum giganteum

Other common name: Sowbroad

FAMILY: Primulaceae *ORIGIN:* Mediterranean region

The most commonly grown Cyclamen is *C. persicum giganteum.* It has heart-shaped and attractively marked leaves with fleshy stalks. The flowers are borne on long erect stalks well above the foliage. The colours of flowers are delicate pastel shades of pink, purple or red or white and of various other hues. The flowers have reflexed petals in a windblown manner appearing like butterflies with their wings swept back. In some varieties, the flowers are fringed, frilled, margined and fragrant. There are hundreds of attractive varieties evolved by breeders, mainly in Holland and Belgium. The important varieties are Apple Blossom (pink), Crimson King (deep crimson), Excelsior (white), Fragrant Gem (white), Royal Rose (deep rose), Rose of Zehlenderf (salmon-pink) and Scarlet King (scarlet). There are also varieties with double flowers but the singles are more beautiful.

Cyclamen does not grow satisfactorily in the plains but thrives exceedingly well in the hills in a glass-house or in a protected place. However, with great care it is possible to grow it in the north-western plains, particularly where the winter is long and cool. It lasts only one year on the plains. The plants are raised from seeds or corms. It is easier to grow plants from corms. The corms are planted in February on the hills or in August for indoor display when the young plants are brought inside the room in September to bloom from December to April or May. In the plains, the tubers are planted in October. The corm is set about half in and half out of the soil in a small pot. The potting mixture contains soil, sand and leaf-mould in equal proportions. After the flowering is over, the watering is reduced slowly and in June the pot is taken out from the room and kept in a cool shaded place until August when these are repotted. The seed is best sown in September or from August to November in a seed pan and covered with glass and paper, until the emergence of seedlings. The seedlings are transplanted into small individual pots in March-April and watered carefully. These plants will flower after 16 to 18 months of sowing.

The plants require partial shade and cool and moist conditions for good growth. They thrive best in a cool and humid environment where the temperature does not rise above 15.5 C. The soil must be well-drained. The pots should always be watered from bottom to avoid rotting of the crown of the plant. When the flower buds appear, liquid manure is applied along with a little potash to the plants once a month or so until the flowers open to encourage better flowering.

Cyclamens are excellent for pots and cut flowers. The hardy cyclamens can be grown in beds under tall trees.

The hardy cyclamens can grow well on the hills. These include the summer-and autumn-flowering species like *C. africanum* (pale pink), *C. cilicium* (pale pink), *C. europaeum* (crimson) and *C. neapolitanum* (rose-pink or white) and the winter and spring flowering *C. atkinsii* (carmine-pink or C. *coum* (magenta), *C. hyemale* (carmine), *C. libanoticum* (pink) *and C. repandum* (deep carmine-pink).

DAHLIA

Dahlia variabilis

FAMILY:Compositae ORIGIN : Mexico

Dahlia was named in honour of the Swedish botanist, Dr. Andreas Dahl, a pupil of Linnacus. It is a native of Mexico from where it was first introduced into Madrid (Spain) in 1789 and later from Spain it went to England in 1798 and to other European countries. The modern varieties of the Dahlia have arisen as a result of crossing between different species and varieties, chiefly *D. imperialis, D. coccinea, D. jaurezii* and *D. merckii.* Most of the new varieties are evolved by crossing between different varieties and chance mutations in nature.

The height of plants varies from 30 cm to 1.5 or 2 m, depending upon the varieties. The leaves are rounded with a slightly serrated margin and produced opposite at each node on the stem. The different varieties of dahlia have been classified into the following 11 distinct classes based upon the shape and size of flowers and the formation of petals:

1. **Single-flowered dahlias**—Flowers 10 cm or less across, with a single outer ring of florets surrounding a central disc. This class includes Show Singles having round-ended overlapping petals and the singles with more pointed petals that are not so overlapping. 'Liebenswert', 'Kokette', 'Frances'.
2. **Star dahlias**—Cupid-shaped flowers having 2 to 3 rows of pointed petals. 'White Star'.
3. **Anemone-flowered dahlias**—Flowers have a dome-shaped central disc of tubular florets surrounded by an outer ring of ray florets, 'Comet'.
4. **Collarette dahlias**—Flowers about 10 cm or more across with a single row of ray florets and a ring of shorter-ray florets around the central disc.'Aureoline', 'Suntan', 'Lady Friend', 'Gerring's Elite', 'Scarlet Queen'.
5. **Paeony-flowered dahlias**—Flowers have two or three rows of flat florets with a disc in the centre. Sub-divided into Large (over 20 cm), Medium (15-20 cm) and Small (up to 15 cm), depending upon the size of flowers. 'Bishop of Llandaff'.
6. **Decorative dahlias**—Fully double flowers with flat petals, seldom showing a central disc. Sub-divided into Large (over 20 cm), Medium (15-20 cm), Small (10-15 cm) and Miniature (upto 10 cm):

Large : 'Croydon Masterpiece', 'Croyodon Ace', 'Croyodon Dawn', 'Croyodon Snow top', 'Liberator', 'Peter Ramsey', etc.

Medium : ‘Ballego’s Glory’, ‘Peace’, Arc de Triomphe’, ‘House of Orange’, etc.

Small : ‘Burmas’, ‘Chinese Lantern’, ‘Edinburgh’, ‘Mary Richards’, etc.

Miniature : ‘Arabian Night’, ‘Doris Duke’, ‘Newby’, ‘Blaze Away’, etc.

7. **Double show and Fancy dahlias**—Fully double globular flowers, over 10 cm across, with central florets slightly smaller than the outer ones with incurved edges and a blunt mouth. ‘Model’, ‘Rondkop’, ‘Standard’, ‘Merlin’, ‘Gloire de Lyon’, etc.
8. **Pompon dahlias**—Flowers like those of the show and fancy dahlias in quality but smaller in size. Sub-divided into Large (8-10 cm), Medium (5-8 cm) and Small (upto 5 cm); *Large:* ‘Ascog’, ‘Jean Lister’, ‘Nellie Birch’, *etc.; Medium:*‘Chamois’, ‘Bonny’, ‘Gold Ball’ ‘Leo’, ‘Little David’, etc; *Small:* ‘Doria’, ‘Diana Gregory’, ‘Rhonda’, ‘Yellow Gem’, ‘Glow’, Rosea’, etc.
9. **Cactus dahlias**—Fully double flowers which do not show the central disc and the ray florets being pointed, partially revolute, straight or incurving, shaped like a star. Sub-divided into Large (20 cm), Medium (15-20 cm), Small (10-15 cm) and Miniature (upto 10 cm).

Large : ‘Albert’, ‘Ogey’, ‘Arab Queen’, ‘Rodeo’, ‘The Colenol’, etc.

Medium : ‘Carnival’, ‘Eclipse’, ‘Guiding Star’, ‘Polar Beauty’, ‘Gladys’, etc.

Small : 'Cheerio', 'Doris Day', 'Grace', 'Preference', 'Pinnacle', etc.

Miniature : 'Andries Orange', 'Little Mermaid', 'Lovely Looker', 'Pinkatte', 'Pirouette', etc.

10. **Miscellaneous dahlias**—Flowers are different from those mentioned above.
    'Giraffe'—Double orchid-flowered, 'Disneyland'—Smaller flowered, heavily speckled and striped.

11. **Dwarf bedding dahlias**—Dwarf, 30-60 cm high, with small single or double flowers of deporative, cactus anemone and miniature forms.

Singles : 'Coltness Gem', 'Northern Gold', etc.

Decorative : 'Maureen Creighton', 'Park Beauty', 'Rothesay Castle', etc.

Cactus : 'Frank Soeten', 'Spectacular 'Midget', etc.

Anemone : 'Bridesmaid', 'Honey'.

Miniature : 'Top Mix', 'Unwin's Dwarf Hybrids'.

Uses: Dahlia is suitable for cut flowers, pots, beds and annual and mixed borders. It can also be grown in a shrubbery especially in a newly-planted one to fill in the space and provide colour.

Propagation: The plants are propagated from tubers, terminal stem-cuttings and seeds.

Seeds: The varieties do not breed true when propagated from seeds. This is particularly noticed in the double forms which produce a large percentage of plants with semi-double or single flowers when raised from seeds and often no two individuals are alike. However, the dwarf bedding Single dahlias are usually grown from seeds. The seeds are sown in September-October in the northern plains, in May and September in Bangalore and other adjoining areas and in March-April in the hills. The seedlings are transplanted into beds or pots after about a month of sowing.

Tubers: The double decorative, cactus, pompon and other forms are generally raised from tubers or stem-cuttings. Tubers are planted at the end of June in the northern plains and in March-April in the northern hills. The old clumps of roots which usually have three or more tubers attached to the stem, depending upon the variety, are divided before planting. The tubers can be cut from the stem with a sharp knife or razor-blade, ensuring that each tuber has at least one "eye" to produce a new shoot. The eyes on the tubers are towards the crown-end or the stem-end. The tubers are planted about 15 cm deep and 90, 75 and 45 cm apart in tall, medium and dwarf (bed) types, respectively. A tuber will sprout in July with the onset of the monsoon. The plants raised from tubers start flowering in November-December on the northern plains, while in Bangalore and other adjoining areas they flower during July-August when planted in May.

Cuttings: After the tubers have sprouted and the young shoots coming out from the crown-end have attained a height of 10-15 cm, small terminal stem-cuttingscan be taken to raise new plants. They can be taken periodically from July to September from the same tuber, as new shoots appear later after the cuttings have been taken. The shoot is cut a little below the first joint above the tuber with a sharp razor-blade. The cutting is usually 8-10 cm long and should be solid and not hollow inside. After removing the lower leaves and dipping the cut end into a rooting hormone like Seradix B, the cuttings are inserted into pots containing a mixture of coarse sand and peat or sand and vermiculite alone. About 4 to 5 cuttings are placed against the side of an 8-cm pot. The rooting medium is firmed after inserting the cutting and watered carefully. The cuttings are kept in a moist place for rooting and not watered frequently to avoid damping off. After 2 to 3 weeks when the cuttings have rooted, they are potted singly in 8-cm pots containing equal parts of soil, sand and leaf mould. Later in October on the northern plains, these rooted plants can be transplanted into beds or singly in 25- or 30-cm pots. On the hills, the tubers can be sprouted in late winter (December-January) in a glass-house for taking cuttings. The rooted plants are raised in March-April for planting into beds outside. The plants raised from cuttings usually flower about 2 to 4 weeks later than those grown from tubers.

Cultivation: The plants raised from cuttings are treated in the same way as those from tubers. When the plants are about 15-20 cm high, the terminal shoot is pinched off to promote the growth of side-shoots which will make the plants bushy. Pinching off the growing point is also practised in young seedlings raised from seeds. Usually a bamboo stake is inserted near the hole in which the tuber is planted to provide support to the plants later. Before planting tubers or young plants, the soil should be well prepared and a heavy dressing of cowdung manure or compost and 120 gm bonemeal to a sq. metre is applied.

Watering: Dahlias need frequent and heavy watering instead of very frequent and light sprinkling. However, waterlogging should be avoided as it is harmful to plants.

Feeding: Generally, there is no need to apply organic manure later once it has been incorporated into the soil at the time of preparation of beds before planting. Often a light top-dressing of leaf-mould or cowdung manure will be beneficial to plants. In poor soils, a top-dressing of complete fertilizers may be useful. However, frequent and heavy applications of nitrogenous manures or fertilizers should be avoided as they tend to deteriorate the storage quality of tubers and also affect the quality of blooms.

Staking and tying: The young shoots must be tied with a soft string to the bamboo stakes inserted near the base of the plants. The knots should be tied loosely to allow the stems to increase in size.

Disbudding: This is necessary to obtain large quality blooms. Usually, there are three flower-buds at one place, and the central bud, often called the crown bud, is retained to flower, while the other two are removed. However, if the crown bud is damaged or is not likely to open fully, it can be removed and one of the side buds retained. One or two lateral shoots below the flower can also be removed to obtain large blooms on long and sturdy stems. The lower shoots may be retained to provide a succession of blooms.

Lifting the tubers: The stems of the old plants after flowering is finished in February or March on the northern plains are headed back 15-25 cm above the ground level. The roots are then lifted from the ground with a fork, taking care not to injure the crown of the root. After lifting, the tubers are stored during summer until next planting time in June. On the northern hills, the tubers are lifted in October-November.

Storage of tubers: The tubers can be stored in a cool room on shelves or in a layer of sand, but before storing they are dusted lightly with 5 per cent DDT or BHC and flowers of sulphur as a protection against insects and diseases. The tubers are not allowed to dry up in the heat; they are sprinkled with water whenever they tend to do so. A cool temperature (4.5 to 7.5 C), free circulation of air and low humidity are necessary for proper storage. If the plants are in pots, they are to be left there after cutting the stem just after the flowering ends and are put in the shade. Water is sprinkled occasionally to prevent the shrinkage or drying out of tubers.

Pot tubers: As mentioned earlier, the rooted cuttings from pots are transplanted into beds where the plants are to flower. Sometimes when the surplus late cuttings are left in the pots without producing flowers, they form small tubers which are known as pot tubers. The growths in these plants are always stopped by pinching the tips frequently. These small pot tubers are excellent for raising new plants and produce good blooms of the same quality as those of the plants grown from large tubers.

Diseases and insects: The common diseases are the mosaic virus disease and mildew. The virus-affected plants should be removed and destroyed immediately and always virus-free tubers or cuttings should be used. Dusting of sulphur helps to control the mildew.

The insect pests are aphids, thrips and caterpillers. Aphids can be controlled by spraying malathion or Basudin, while the thrips are controlled with rogor, ekalux or thiodau. The caterpillars can also be controlled by spraying or dusting sevin.

EUCHARIS

Eucharis amazonica (E.grandiflora)

FAMILY: Amaryllidaceae *ORIGIN:* Columbia

This is a very attractive bulbous plant, 30-45 cm high, with large ovate-lanceolate foliage, about 45 cm long and dark green in colour. The flowers are large (7.5 cm across), waxy white and sweetly scented and there are about 5 to 7 blooms in a scape borne on a long stem. The flowers in Eucharis are smaller than those in Crinum. It flowers during the cold season.

Eucharis can be grown successfully in pots and borders. It is also useful as an indoor plant and for cut flowers.

The bulbs can be planted in October on the plains where it does better than on the hills. In the hills, it can be best grown in a glass-house. It requires warm and moist conditions and thrives well in semi-shaded situations. The plants like plenty of water and a rich soil. They do not require frequent repotting.

FOXTAIL LILY

Eremurus himalaicus

FAMILY: Liliaceae *ORIGIN:* India

Eremurus is a perennial plant with tuberous roots. The species *E. himalaicus* is a native of the Himalayas. The other habitats are Central and South-Asian countries like Turkestan; Siberia and Persia. It grows well only in the hills. It is a majestic plant, 1.5-2 m tall with very long and linear, sword-like leaves arising directly from the fleshy rootstocks. The plant bears a very long (90-120 cm) flower spike studded with small (over 2.5 cm across) star-shaped white flowers on a leafless stem. The other commonly grown species are *E. robustus* and the dwarf-growing *E. bungei* with rosy-pink and bright yellow flowers, respectively. The tall species *E. elevesi* with shell-pink flowers is also popular. The Shelford Hybrids have 90-cm long spikes of cream, yellow, apricot, pink or orange, while in the Tubergeni Hybrids the spikes are heavier and of the same colours but no longer (2-3 m) stalks.

Its spider-like tuberous roots are best planted from

August to November on the hills, about 45 cm apart in a shallow hole. The planting can also be done in March. It flowers during summer, May and June. The plants require a rich and well-drained soil and cool conditions for a good growth. They are not disturbed for a long time once they are planted and the roots are lifted and divided after about five years. During winter, the crown of roots may need some protection and can be covered by sand or peat.

Eremurus is excellent for growing in shrubberies, mixed borders, backgrounds and for cut flowers.

FREESIA

Freesia refracta

FAMILY: *Iridaceae* *ORIGIN:* South Africa

The modern large-flowered varieties of Freesia are hybrids resulting from crosses between different species, particularly *F. refracta, F. armstrongii* and others. The plants are low-growing, about 30 cm high with linear leaves. The flowers are trumpet-shaped and strongly scented, borne in racemes on long stems. The flowers are brightly coloured including various shades of white, cream, yellow, orange, pink, red, mauve, bronze and blue. The Freesias are usually in mixed colours like the Rainbow Mixture. However, there are varieties in separate colours also such as Buttercup (primrose yellow with orange shading), Blue Banner (sky blue, a white throat), Gold Coast (deep orange-yellow), Margaret (cyclamen-purple), Pink Giant (cherry pink with a silvery white throat), Rynveld,s Golden Yellow (deep golden-yellow), Sapphire (blue), White Swan (white) and several others. There is also a double-flowering, creamy-white and fragrant Freesia.

Freesia is suitable for growing in beds, pots and shallow pans. It is also commonly grown indoors and for cut flowers. The flower racemes should be cut when the first flower on it has opened and afterwards when placed in water the other flowers also open later and last for a long time.

For potting, the soil mixture consists of two parts soil, one part leaf-mould and one part cowdung manure. If the soil is heavy, it would be beneficial to add a little coarse sand for proper drainage. About 6 to 8 corms can be planted 2.5 cm deep in a 15-cm pot. The pots should be kept in shade and watered sparingly until the growth has appeared when watering may be increased. The planting is done in October on the plains and from August to November on the hills. Usually the plants come into bloom after twelve weeks from the date of planting. They flower during February-March in the plains. In the hills, the plants need protection from frost and extreme cold during winter and for this purpose they are best grown in a glass-house or indoors at a temperature of 10 to 15.6 C. The flowering lasts about six weeks and by successive plantings, it is possible to extend the time of flowering. Freesia can also be grown from seeds but for propagation of named varieties, it is best to plant the corms. The plants thrive best in a sunny situation and dry conditions. Overwatering should be avoided and the soil kept in little dry and not moist for obtaining good flowering. The plants respond well to a liquid manure once a fortnight during flowering. The plants require staking as the stems are straggly in habit. After flowering, water should be withheld until the leaves become brown when the pots can be removed to a shaded place and kept there for planting the following season.

CROWN IMPERIAL

Fritillaria imperialis

FAMILY: Liliaceae *ORIGIN:* Europe, Asia and North America

Fritillaria grows well only on the hills. The plants are tall (90-105 cm) with whorled narrow foliage. The pendulous, large bell-shaped flowers are borne in circular clusters at the top of 60-90 cm long and strong stems surrounded by a green crown of leaves. The flowers are yellow, orange, brick-red or copper-red and give off an evil odour.

Fritillaria is commonly grown in beds, borders, backgrounds and rock gardens. It is also suitable for naturalizing and excellent for cut flowers.

The bulbs are planted during autumn (August to November). They are planted deep, about 15-20 cm and 30 cm apart. The plants thrive well in partial shade and rich and moist soil with plenty of humus. They are generally left undisturbed and continue to thrive for several years.

GERBERA

Gerbera jamesonii

Other common names: Barberton Daisy, Transvaal Daisy

FAMILY: Compositae *ORIGIN:* South Africa

This is a dwarf perennial herbaceous plant which grows successfully both in the plains and the hills. The plants are about 30-45 cm high with 15 cm long, broad and deeply-lobed foliage set in the form of a rosette at the base. The flowers are 12-15 cm across, daisy-like, single or double,

Plate 15—Ranunculus

(*See page* 228)

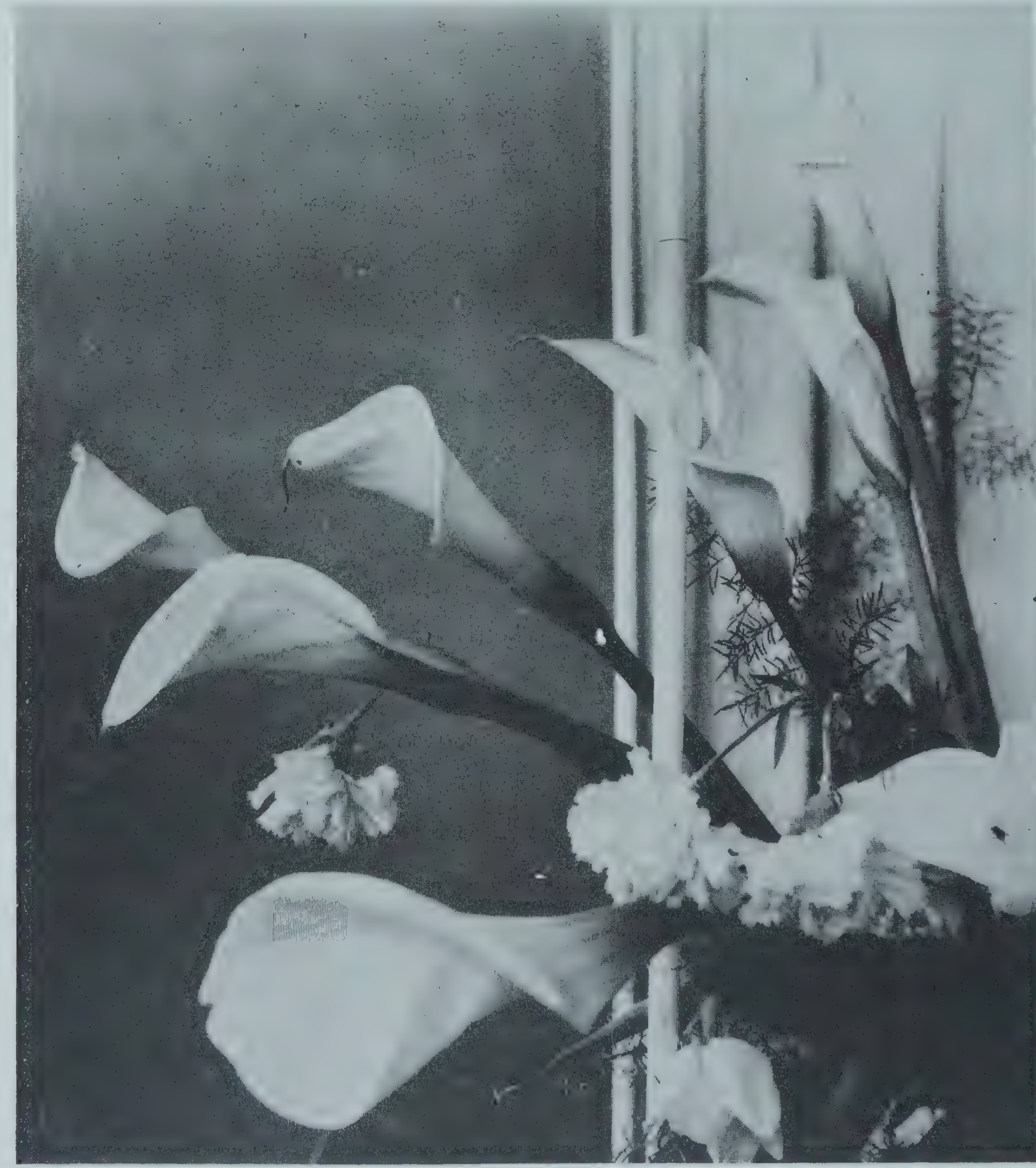

Plate 16—Calla Lily—in a flower arrangement (*See page* 234)

Plate 17—Canna (*See page* 237)

Plate 18—Nymphaea—Water Lily (*See page* 272)

in various attractive rich and pastel shades with narrow ray petals borne on thin, long and leafless stems. The flowers may be white, cream, lemon-yellow, orange, brick-red, scarlet, pink, salmon, maroon, terracota and various other shades. Both single and double flowering varieties are very attractive and many double varieties are also bi-coloured. Tetroploid geberas with larger blooms, semi-double with thicker petals borne on long stout stalks are grown widely for cut flowers.

Gerbera is ideal for beds, borders, pots, rock gardens and cut flowers. The cut blooms when placed in water last for a long time.

The plants can be propagated from seeds and division of clumps. The seeds are sown in June and the seedlings are pricked at the two-leaf stage. After about 1½ months, the seedlings are transplanted into 15-cm pots, first in a light soil and later after 1 to 1½ months in a richer soil. The plants thrive best in a well-drained and rich soil and a sunny situation. They flower throughout winter and spring. The plants require plenty of manure, leaf-mould or humus for a good growth and flowering. In the hills Gerbera flowers in summer. Sowing of seeds and division of clumps are done in spring.

GLADIOLUS

Gladiolus

Other common name: Sword Lily

FAMILY: Iridaceae *ORIGIN:* South Africa

With its majestic flower spikes having florets of massive form, brilliant colours, attractive shapes, varying sizes and excellent keeping quality, the gladiolus is ideal both for garden and floral decorations. It was brought into cultivation from its native habitat in South Africa, perhaps during the ancient Greek period. Its systematic improvement began only in the early years of the present century after the discovery of the Primulinus *(Gladiolus primulinus)* gladioli growing wild near the Victoria Falls in South Africa. The hybridization of Primulinus and a few other species, such as *G. byzantinus, G. psittacinus, G. cardinalis, G. childsii, G. colvillei* and *G. gandavensis,* resulted in the present-day gladiolus, a flower of perfection. This remarkable improvement was made during the post-war period. It is undoubtedly the best bulbous flower in our country and ranks next only to tulips in Holland and other countries.

Uses: Gladiolus is excellent for beds, pots, harbaceous borders and cut flowers. As soon as the first floret has fully opened and the others are showing colour, the flower spike is cut neatly with a sharp knife and immediately placed in water. The other top florets will then open gradually and last over a long period. The spikes can last longer in the home if a little portion (1.5 cm) of the stem is cut off on alternate days and fresh water put in the container.

It can be grown successfully both in the plains and the hills up to an altitude of about 2,400 m. It grows well in any type of soil which is well drained. In a cool wet soil, the corms take a longer time to sprout, which results in much delayed flowering.

Types and Varieties: The two most important types are the larger-flowered varieties, the butterfly and the miniature gladioli. In both there are early, mid-season and late-flowering varieties. The butterfly types have small spikes and flowers in various colours and in many cases with dark and attractively coloured throats and are ideally suited for small gardens and flower arrangements. Besides the primulinus and colvillei are two other types, of which the latter is suitable for growing under glass-house conditions. The primulinus types have small flowers borne on thinner stems and have a hooded top petal in each floret.

The flowers may be large, medium or small in size, sometimes with ruffled petals, blotches or streaks. The colours range from white to near black, including pink, salmon, orange, red, scarlet, maroon, yellow, cream, greenish, purple, lilac or mauve, violet and several other shades. Some varieties are also 'smoky' in colour. There are also double-flowering varieties. The important varieties are Apple Blossom, Friendship, Oscar, George Mazure, Fay, Gold-Dust, Tunia's Yellow Triumph, Elizabeth the Queen, Jo Wagenaar, Spic and Span, Spot-light, Dream Girl, Goeff Whiteman, Blaur Dominos, Polygoon, Banaras, Mary Housley, Snow Princess and many others. Some of the important gladiolus varieties used for cut flowers in export market are Vinks Glory, Carmine, Spic and Span, Happy End, Charles-de-Gaule, Eurovision, Trader Horn, Hunting Song and Peter-Peers.

A few attractive varieties of gladiolus have been selected at the Indian Institute of Horticultural Research, Institute Bangalore and Indian Agricultural Research Institute, New Delhi.

In beds and pots: Gladiolus grows almost equally well in beds and pots. The beds should be dug thoroughly and prepared finely. Before the final preparation, rotted cowdung manure, leaf-mould or compost, about 5 to 6 kg per square metre should be added. The manuring should never be done heavily as excessive nitrogen will cause the flower spikes to become tall and thin and the flowers will lose their brilliance. An application of 60 gm of bonemeal per sq. metre is also beneficial.

The potting mixture consists of one part soil, two parts well-rotted cowdung manure or leaf-mould and half-a-part sand. Bone-meal, about two tablespoonful, and about a cigarette tinful of wood ashes should be mixed before planting.

Planting: In the northern plains it is best planted from September to October and sometimes even earlier in August. The flowering takes place from December to March or April. In the hills, planting is done in March-April and it flowers from May or June to August or September. The time of flowering depends upon the variety and the time of planting. Successive plantings of suitable varieties will ensure continued flowering over a longer period.

Gladiolus is generally planted from corms. It can also be grown from seeds but the variety may not come out true in such cases. The corms are usually graded and sold in different sizes but in our country no specific gradations in corm sizes are available. The size of spike and flower depends upon the size of corms planted. A medium-sized corm with a high crown is better than a larger and flatter corm. Usually a 10-12 cm corm is good for planting but a larger size, 12-14 cm, is better for obtaining exhibition blooms. Often it is useful to peel off the brown scales from the corms carefully and keep them in a tray in a warm and dark place which will encourage sprouting. After sprouting, these can be planted in the beds or pots. The corms are planted about 15 cm apart in rows spaced 30-45 cm apart. Sometimes these may be planted in clumps of three or four, particularly for mass effect or in borders. The depth of planting corms is about 10-13 cm, deeper planting being adopted in a lighter soil. For rapid multiplication of a variety the small cormlets which are produced every season along with the large corm may be planted, preferably after soaking them into water for about 24 hours. These cormlets take about 2 to 3 years to come into bloom.

Feeding: Gladiolus grows best in a bed which has been manured previously for another crop. It does not require heavy manuring or nitrogen as that tends to deteriorate the quality of flowers. The best manures are organic manures like well-rotted cowdung, leaf-mould or compost but artificial fertilizers are generally not used. After 6 to 8 weeks of planting, the plants may be fed with a liquid manure. This may be applied once a week and an application of light soot water can also be given about once a month or fortnight. At the time of emergence of flower spikes, a dressing of about 2.5 cm thick layer of leaf-mould is beneficial in producing better flowers with stronger spikes and better development of corms.

Watering: The plants may be watered once a week or fortnight, depending upon the weather. During winter, frequent watering may not be needed.

Earthing and staking: After about 6 to 8 weeks of planting, the plants can be earthed up. After the emergence of spikes they may be staked so that the spikes do not fall down when there is a strong wind. However, staking is not necessary when the plants are grown closely or in clumps and it is also not needed in the case of miniature, butterfly or primulinus gladioli. Care should be taken not to injure the leaves at any stage as it is harmful to the plants.

Cutting of spikes: The spikes may be cut as close to the base as possible with a sharp knife or pair of scissors after the first flower on the spike has opened. Later the other flower buds on the same spike will open in sequence slowly starting from below and continuing upwards when placed in water.

Lifting and storage of corms: After flowering when the leaves have turned yellow and dried, the corms are lifted from the ground preferably with a fork and care is taken not to injure the corms while digging them out. After drying the corms thoroughly, these are stored in a cool dry place. It is better to dust the corms lightly with 5 per cent DDT and put them in alkathene bags or butter-paper bags which have a few perforations for proper aeration or wrapped in old newspapers. The corms are best stored in a refrigerator or a cold storage room. The cormlets of each variety may be kept separately if these are to be planted next season.

The corms should be planted after dipping them for one hour into 0.05 per cent aureofungin or 0.1 per cent Benlate solution. Two sprays of aureofungin antibiotic or Benlate, one at the 6-leaf stage and another before 20-30 days of lifting the corms from the ground when the foliage remains still green should be given to the plants.

Diseases and insect pests: The most common diseases are the Fusarium and Botrytis rots which cause the rotting of corms in the field and during storage. During storage, the corms may be attacked and damaged by Aspergillus, Penicillin and other fungi, resulting in rotting of corms. In plants raised from disease-affected corms, the leaves turn prematurely yellow and the flower spikes become stunted. It is not possible to control this disease by fungicides. However, to check the disease it is necessary not to grow gladiolus in the same beds every year as the causal organism is soil-borne.

Among the insect pests attacking gladiolus, thrips are important which damage the leaves and petals by silvering them. These can be controlled by spraying or dusting malathion frequently, once a fortnight or so. Caterpillars which also injure the leaves and flower buds can be controlled by spraying or dusting Sevin. It is useful to dust the corms before storage with 5 per cent Gamma BHC or by dusting naphthalene, about 30 gm for every 100 corms and covering them with old newspapers or gunny bags to retain the fumes. It is better to treat the corms with BHC dust and Capten before storing them. The corms are best stored at 5° - 10°C temperature and 80-90 per cent relative humidity.

GLORY LILY

Gloriosa superba

FAMILY: Liliaceae *ORIGIN:* Tropical Asia including India and Africa

Gloriosa superba is a native of our country. It is a climbing plant with tendrils with the help of which it can climb on a trellis or screen. It produces most exquisite blooms which are primrose-yellow on opening, changing to dark red or orange-red with wavy and heavily corrugated petals. Its tubers are long and of pencil thickness. Another species, *G. rothschildiana,* is also commonly grown. Its flowers are large, crimson and yellow. The other species available are *G. carsonii* with flowers of dark chocolate or maroon and lemon-yellow at the base, G. magnifica having deep rose-red, violet-shaded flowers, *G. plantii* with salmon-orange and lemon-yellow flowers and *G. richmondensis* with large pale yellow or yellow and salmon-red flowers. Recently, several new species and varieties of Gloriosa have been introduced from South Africa at the National Botanical Research Institute, Lucknow (U.P.).

Gloriosa is suitable for growing both in pots and in the ground. The flowers are excellent for cutting.

The tubers are planted horizontally in March-April. The flowers are produced during July to September. The plant requires frequent watering and a light soil. In the hills, it is not a hardy tuber as the plants are susceptible to frost.

GLOXINIA
Sinningia speciosa

FAMILY: Gesneriaceae *ORIGIN:* Brazil

Gloxinia produces brightly-coloured large, open, bell-shaped flowers in profusion well above the thick velvety green foliage. The plants are about 30 cm tall. The flowers may be bright red, purple, deep scarlet, violet blue, pink, pure white or blue with a white border or scarlet with a white border. In some varieties the flowers have white throats and in many the petals are frilled, ruffled or fringed. There are also the double-flowering varieties. The large-flowered Gigantea varieties with enormous-sized blooms on short and solid stems and F_1 hybrids like the Discoverer, Atlas and Zeus are also well known.

Gloxinia is excellent for growing in pots under porches and indoors.

The tubers are planted in February-March or June-July to flower in the rainy season during August and September. In the hills, they may be planted in February-March to produce flowers in the summer months.

The plant grows best under full sunshine and in a moist soil. It responds well to liquid feeding during the growing season. It can also be propagated from seeds and leaf cuttings but it would be more convenient to plant tubers.

FOOTBALL LILY

Haemanthus multiflorus (H. kalbreyeri)

Other common names: Blood Flower, Red Cape Lily

FAMILY: Amaryllidaceae *ORIGIN:* Tropical Africa

It is a medium-tall plant with large oblong leaves. The large scarlet, ball-shaped or puff-like umbels (flowers) are produced on long (30 cm) and stout stems in spring. There is also a species *(H. virescens* var. *albiflos)* with white flowers.

The Football Lily can be successfully grown in pots. The bulbs are planted in February-March on the plains and during March-April on the hills. The plant should not be watered during winter before flowering when it is in a dormant condition. It requires a sandy-loam and well-drained soil.

DAY-LILY

Hemerocallis fulva and other species

FAMILY: Liliaceae *ORIGIN:* Europe and Asia

The plants are tall (60-90 cm or more) with rush-like foliage. The large trumpet-shaped flowers are borne on long and branched stems. The colour of flowers may be coppery or tawny orange, yellow-orange, bright orange, pale yellow, lemon-yellow, golden-yellow, apricot, primrose-yellow, deep orange-yellow, velvety crimson, deep pink, buff pink, red, purple, pale canary or various other shades. The modern varieties are hybrids of crosses between different species like *Hemerocallis fulva* (yellow-orange), *H. flava* (pale ochre), *H. aurantiaca* (bright orange), *H. citrina* (lemon-yellow) and some others. There are also varieties having double flowers but the single-flowered varieties are more common.

The Day-Lily is ideal for growing in the background of a herbaceous border, in front of a shrubbery or along the side of ponds or streams. The plants are raised by means of division or from seeds. The division can be done in March both in the plains and on the hills. The plants thrive best in a rich, fertile and moist soil and a sunny situation. They grow well near a pond or stream where there is enough moisture in the soil. They flower during the summer months of April to June.

HYACINTH

Hyacinthus orientalis

FAMILY: Liliaceae *ORIGIN:* Palestine, Syria, Lebanon, Turkey and Asia Minor.

The wild hyacinth *(Hyacinthus orientalis)* produces loose racemes of small, bell-shaped, blue florets on slender stems. The modern hyacinths having a stout and dense raceme with 30 to 50 bell-shaped florets and strap-shaped leaves have been evolved by inter-breeding and selection from the wild species and cultivated varieties. The colour range in flowers in modern varieties includes white, deep red, pink, light blue, dark blue, mauve, purple and yellow. Several varieties also arose from sporting, such as Princess Irene (pale pink) from the variety Pink Pearl having deep pink flowers. There are also a few double-flowering varieties like Scarlet Perfection which is a sport from the famous variety, Tubergen's Scarlet.

There are several varieties in different colours, such as the white-flowered Innocence, Roman, Hoar Frost and a few others, Ann Mary, Pink Pearl and Princess (Irene) with pink flowers, Tubergen's Scarlet, Scarlet Perfection (double) and Cyclop with red blooms, Vanguard, Borah and Winston Churchill having light blue flowers, the dark blue-flowered King of the Blues and Grand Maitre, the lilac-mauve Amethyst, the deep rose-purple Lord Balfour and the yellow-coloured City of Harlem and Yellow Hammer. Besides, there are two other types of hyacinths, namely, Roman hyacinth and Cynthella hyacinth. The Roman hyacinth is a multi-flora type with several small graceful spikes on each plant and is early flowering. A famous variety of this type is named Borah which produces lavender-blue flowers. The Roman hyacinths are ideal for growing in bowls, pots and window-boxes. The Cynthella hyacinths, also known as Dutch, Roman or miniature hyacinths, are small-sized bulbs of the usual varieties which produce small spikes and are sold in different colours instead of named varieties. They are suitable for growing in window-boxes, pots, bowls, shallow-pans, etc., as well as in beds and borders. The early-flowering Rosalie (bright pink) and Vanguard (light blue) are the two most beautiful miniature hyacinths. Specially prepared bulbs by being stored early at controlled warm temperatures suitable for early blooming are often sold by the Dutch bulb-growers. They are usually available in different colours and are commonly used for early forcing.

Hyacinths are excellent flowers for beds and pots. They are also grown indoors in bowls, pots, window-boxes, shallow-pans and in a special kind of glass-vases, known as hyacinth glasses, in which only water and a few pieces of charcoal or bulb-fibre (a special type of medium for bulb-growing) are used for growing the plants.

Hyacinths thrive better in a cool climate on the hills. However, they flower well in Delhi and other adjoining areas in the northern plains when grown from imported bulbs or from bulbs obtained from the hills. The bulbs are grown in

October in the plains and they flower in February-March. In the hills the bulbs can be planted in February to flower in April-May. The bulbs are put about 12-15 cm deep in the soil and about 15 cm apart. The plants grow best in a well-drained and well-manured soil. At the end of the flowering season, the bulbs are lifted and stored until the next planting. Before planting the bulbs are kept in a cool dark place or plunged in soil or peat outside (particularly in the hills) for about 8 to 12 weeks until sprouting takes place and the shoots become 60-90 cm high. They can then be brought inside the warm room where they are to flower. For multiplication of bulbs, the ripened bulbs are cut across at the base to a depth of about 1.5 cm before planting. Small bulblets will be formed along this cut when the mother-bulb is grown in the soil in September-October on the hills. The propagation can be done in the hills only. The first spikes produced on the mother-bulbs planted for propagation are removed to encourage better formation of the bulblets. These bulblets may be planted in beds in early summer and they flower within about three years.

SPIDER LILY

Hymenocallis littoralis (Syn. *Pancratium littorale)*

FAMILY: Amaryllidaceae *ORIGIN:* South America

The plants are tall (30-61 cm) with long, broad, strap-shaped leaves. The flowers are white, spider-like and fragrant with six long, delicate, narrow segments united at the base by a thin membranous cup or corona. The flowers are produced in umbels on long stalks during the rainy season. It is suitable for growing along the paths, near a water channel or pool and in pots. It looks attractive when grown in clumps.

The bulbs are planted in September-October after the flowering is finished. The plants require a rich and well-drained soil for a good growth. They can be grown in sunny or semi-shaded situations. The plants thrive well in pots.

IRIS

Iris (several species)

Other common name: Flag

FAMILY: Iridaceae *ORIGIN:* South-East Asia and Southern Europe

Iris grows and flowers best in the hills. However, it can be grown successfully in Delhi, Punjab and Uttar Pradesh where the climate is cool and dry. It does not flower in Calcutta and neighbouring areas. A few Iris species like *I.-nepalensis, I. kamaonensis* and *I. kashmeriana* are natives of the Himalayas.

There are several botanical species of Iris. The two most important groups, commonly cultivated in gardens, are the rhizomatous-rooted or the tall and dwarf Bearded Flag or German Iris and the bulbous-rooted Dutch, Spanish, and English Iris. The Himalayan Iris species, *I. nepalensis, I. kamaonesis* and *I. kashmeriana,* are of the rhizomatous type. The flowers of Iris, particularly of the Dutch and Spanish types, are very showy and last well if cut while the buds are opening.

The rhizomatous German Irises are tall and bearded having a beard at the top of the three lower petals which are also known as the fall petals because of their drooping nature unlike the other three upper or standard petals. The plants are 45-60 cm tall with sword like leaves. There are dwarf-growing varieties also. The flowers are borne on 61-90 cm long stems. The colour of flowers in the old varieties was purple or blue but now as a result of hybridization between different species, several new colours have been developed including white, yellow, light or dark blue, rose, pink, bronze and red. The Himalayan species *I. nepalensis* is pale lilac in colour while *I. kashmeriana* and *I. kamaonensis* have white and purple mottled liliac-coloured flowers. It is a beautiful sight to see them flowering in the woods.

The rhizomatous iris is comparatively easier to grow than the bulbous iris. The plants are ideal for growing in borders or in clumps. They thrive best in a cool and dry place and in a soil which is rich in lime and they dislike moisture. The plants are propagated from rhizomes, usually in October, both in the plains and in the hills. In the plains, they flower in February-March, while in the hills the flowering takes place in March-April. When the plants have grown thick after a few years, their rhizomes are divided and replanted.

The important tall-bearded German Iris varieties are White City (white), Sahara (yellow), St. Rollux (deep yellow), Aline (light blue), Sirius (marine-blue), Black Panther (velvety black, bronze-purple), Constance Meyer (pink), Hester Prynne (copper-red), King Midas (dwarf, golden-brown) and Petrea (deep coppery-maroon). The popular dwarf, bearded irises are Burgundy (deep claret), Marocain (glossy, blackish purple), Orange Queen (primrose-yellow) and Prince Louis (blue). A few dwarf-growing iris species, often grown in gardens, are *I.cristata, I. unguicularis (I. styolosa), I. susiana* and others. There are two other commonly cultivated rhizomatous iris species, namely, *I.kaempferi* (Japanese Iris) and *I.siberica* and its hybrids which are water-loving. They are grown along the edges of ponds and streams or in waterlogged or heavy and wet soils. The Japanese Iris does not grow well in a soil which is rich in lime, unlike the other irises.

Most of these dwarf varieties and species are, however, not available in our country.

The bulbous-rooted Dutch, Spanish and English irises are also excellent for borders and cut flowers. They are mostly summer-flowering and are prized for their most exquisite blooms of a wide range of colours and shades, such as white, yellow, orange and blue. The Spanish Irises flower about two weeks later than the Dutch Irises and the English Irises flower almost at the same time as or a little later than the Spanish Irises. The Dutch Irises flower in April-May, while the Spanish and English Irises bloom in June-July. Their method of cultivation is the same as that of the rhizomatous type. The English Iris prefers a heavy and moist soil, while the others thrive well in a cool and dry place. After flowering, the foliage should be allowed to die down. The popular varieties of the Dutch Iris are Blue Champion (pale blue), Bronze Beauty (bronz-blue), Harmony (blue, yellow and orange shades), Imperater (deep blue), Joan of Arc (milky white), Lemon Queen (pale yellow), Wedgwood (blue) and White Excelsior (white). The varieties Gajanus (yellow), Gipsy Girl (purple and yellow), King of the Blues (deep blue), Le Mogol (bronzy-purple), Sulphur Beauty (creamy white) and Frederika (white) are the popular Spanish Irises and Mansfield (deep wine-purple), Mont Blanc (white), Delft's Blue (dark blue) and Queen of the Blues (blue) are the commonly grown varieties of the English Iris. Among the bulbous-rooted Iris species grown in gardens, the well-known are *I. reticulata*(different varieties), *I. histroides, I. bucharica, I. danfordiae, I. tuberosa* and a few others.

RED-HOT POKER

Kniphofia aloides (Syn. Tritoma aloides)

Other common name: Torch Lily

FAMILY: Liliaceae *ORIGIN:* South Africa

The plants are tall-growing (60-120 cm) with clusters of long reed-like foliage. The flowers are closely placed in a 15-cm-long upright raceme or head borne at the terminal end of a long leafless stem. They are bright orange-scarlet changing to citron-yellow in the lower portions of the raceme. The most commonly grown species is *Kniphofia aloides* but there are several others also in cultivation. The modern varieties are hybrids of crosses between different species and the colour of flowers in these ranges from pure white to scarlet including rose, primrose-orange and red.

The red-hot poker is suitable for growing in borders and as accents. The plants can be raised from seeds or rhizomes. The best time for planting is March-April in the hills and October in the plains. The plants thrive best in the hills, while they are not grown successfully in the plains. In Delhi, however, the plants flower for a year or so and then perish. Flowering takes place during summer and the rainy season on the hills and in March-April on the plains. The plants should be left undisturbed for some years before they are divided and replanted. The plants require a well-drained soil and a sunny situation for a good growth. They need protection from frost during winter. Mulching with leaf-mould is good for this purpose.

LILIES

Lilium species and hybrids

FAMILY: Liliaceae *ORIGIN:* China, Japan, Korea,
California (U.S.A.)
and some other places

Many different kinds of lovely lilies are commonly grown in the gardens. In our country, lilies thrive best on the hills but they also grow well in some places such as Bangalore, where the climate is mild all the year round. However, the Easter Lily *(Lilium longiflorum)* grows exceedingly well on the northern plains of our country. Two lily species, L. *wallichianum* and *L.* nepalens, are natives of the Himalayas; the former grows wild in Almora (Uttar Pradesh) and Nepal, while the latter is a native of Nepal. Another native species, *L. nilgherensis,* is from the Nilgiri Hills.

Besides many Lilium species, several beautiful hybrids which have arisen as a result of crosses between different species are also grown in the gardens. These hybrids are very attractive, hardy and vigorous-growing. Lilies may be trumpet-shaped *(L. longiflorum, L. candidum, L. wallichianum),* cup-shaped like a Turk's cap with small, narrow, reflexed petals *(L. martagon),* bell-shaped *(L. canadense)* and bowl-shaped *(L. auratum).* The flowers in many are fragrant *(L. auratum, L.giganteum, L. japonicum, L. speciosum),* while in some *(L. martagon, L. pyrenaicum)* the flowers have an unpleasant odour.

Lilies are ideally suited for growing in flower and shrubbery borders and in pots. The species thriving best in pots are *L. longiflorum*, *L. hansoni*, *L. henryi*, *L. regale*, *L. speciosum*, *L. tigrinum*, *L. formosanum*, *L. brownii* and *L. umbellatum.*

The following are the most popular *Lilium* species:

L. longiflorum (Easter Lily), 60-90 cm, trumpet-shaped flowers of pure waxy white, early-flowering, stem-rooting.

L. auratum (Golden-rayed Lily), from Japan, 1.50-2 m, bowl-shaped flowers, white with a golden ray down the centre of petals and crimson spots, fragrant, late flowering, stem-rooting.

L. amabile, from Korea, 90-120 cm, grenadine-red flowers turkscap spotted with black spots, stem-rooting.

L. brownii (Chinese Lily), 90-120 cm, trumpet-shaped, large, creamy, with purple and green on the outside, stem-rooting.

L. bulbiferum croceum (Orange Lily), 90-150 cm, flowers cup-shaped, bright orange spotted with purple, stem-rooting.

L. canadense, 90-150 cm, flowers bell-shaped varying from golden-yellow to orange-red.

L. candidum (Madonna Lily), 1-2 m white flowers.

L. cernuum, 45-60 cm high, turkscap flowers, small, lilac pink, suitable for rock gardens, stem-rooting.

L. chalcedonicum (Greek Lily, Scarlet turkscap), 1-1.5 m, turkscap flowers, bright scarlet. Also the variety *L.c.-maculatum*, 1.5 m tall flowers, scarlet spotted black.

L. davidii, from China, 1 m tall, flowers recurved, orange-red and spotted black resembling the tiger lily but smaller in size, stem-rooting. The popular varieties are *L.d. Maxwill* and *L.d. Willmottiae.*

L. hansonii (Yellow Martagon Lily), from Korea, 1 m high, flowers orange-yellow with brown spots, stem-rooting.

L. henryi, 1.8-2.4 m high, recurved flowers like *L. speciosum,* orange-yellow, large, late-flowering, stem-rooting.

L. martagon (Turkscap Lily), 1-2 m tall, recurved flowers, purplish-pink spotted black and purple, unpleasant odour.

L. pardalinum (Panther Lily), from California 1.5 m tall, turkscap flowers, red with a yellow centre and maroon spots, late-flowering. The popular variety is *L.p. giganteum.*

L. pomponium, 90 cm tall, small drooping scarlet flowers, suitable for rock gardens.

L. pumilum (Syn. *L.tenuifolium),* 30-45 cm high, small red turks-cap flowers, stem-rooting.

L. pyrenaicum (Yellow Turkscap Lily), 60-90 cm high, flowers bright yellow spotted brown with red anthers, very unpleasant odour.

L. regale, 90-180 cm tall, trumpet-shaped flowers, waxy white with yellow throat, purplish-rose on outside and golden anthers, very sweet-scented, free-flowering, stem-rooting. A pure waxy white variety is also available.

L. sargentiae, from China, 1-1.5 m tall, long trumpet-shaped flowers resembling *L. regale* in colour but more attractive, very free-flowering, stem-rooting, and producing stem bulbils.

L. speciosum, from Korea, 90-150 cm tall, bowl-shaped flowers with reflexed petals, white shaded rose-crimson with beautiful dark raised spots, fragrant, late-flowering, stem-rooting. A pure white form is also available.

L. tigrinum (Tiger Lily), from China, 90-120 cm high, turkscap recurved flowers, light glowing orange with purplish-black spots and protruding stamens, late-flowering, black stem bulbils, stem-rooting. The other flower colours are bright-red variety (Cardinal), cadmium-yellow *(L.t. flaviforum),* salmon-orange *(L.t.-*

fortunei), deep red *(L.t. splendens).* There is also a double-flowered variety *(L.t. flore-pleno).*

Modern Hybrid Lilies—Modern lilies have been developed from crosses between different species. They are vigorous, disease-resistant, generally intermediate in shape and size of flowers of the parent species and beautifully coloured a wide range of colours. They often come true from seed and multiply quickly. The most popular hybrid lilies are the Aurelian hybrids, Backhouse hybrids, Bellingham hybrids, Fiesta hybrids, Mid-century hybrids, Olympic hybrids, Patterson hybrids, Preston hybrids and Zwet's hybrids. In some, there are different strains and varieties also such as the Citronella strain of the Fiesta hybrids, the Golden Sunburst strain of the Aurelian hybrids, the Imperial strain of the Auratum type and a few others.

Cultivation: A cool, porous and well-drained soil is essential for a good growth of most lilies. Many lilies, like *L.-brownii, L.hansonii, L. regale, L. tigrinum,* etc., prefer a sunny situation, while some such as *L. amabile, L. candidum, L. henryi, L. speciosum* and others thrive well in the shade.

Lilies are planted in October on the northern plains. On the hills, early summer-flowering lilies are planted in early autumn and those flowering in July-August or later are planted in early spring. The depth of planting the bulbs varies with the species and varieties. However, the general rule is to plant them about 2½ times deeper in the soil than their own size or depth. Stem-rooting lilies are planted shallow, about 8-10 cm deep and a top dressing of soil or leaf-mould is given, as the stem roots appear above the ground. Further mulching is done during the growth of the plant. Some prefer to plant them deeper, about 13-22 cm deep in the soil, so that the bulbs are covered with at least 10 cm of soil on the top. When one is not certain about the appropriate depth of planting, it is always better to adopt shallow planting. In stem-rooting lilies, it is necessary to keep the soil cool near the root and for this purpose they should be shaded near the base of the plant by growing them among fall shrubs or plants and by placing the pots in the shade.

When growing outdoors, the beds should be dug about 60 cm deep and manured before planting. Direct contact of bulbs with the manure should be avoided. It is better to use leaf-mould than cow-dung manure and while planting the bulbs should be covered all round with sand to protect them from excess moisture.

For potting, a mixture of two parts soil, one part leaf-mould, one part sand and a few pieces of charcoal is ideal. About 20-25-cm pots are suitable for growing lilies.

Watering should be done carefully to avoid water-logging which is harmful. It is useful to add sand to the soil, particularly when it is heavy. After the flowering is finished, watering in pots should be withheld till the leaves dry out and then the pots should be removed to a cool and shaded place and they should be kept there until the next planting. The plants are, however, not disturbed and they are allowed to remain in the same pot for three or four years.

On the hills, the lilies flower in May-June or during July-August and in some cases till October. *L. longiflorum* flowers in early summer (March-April) on the northern plains.

Propagation: Lilies are propagated from seeds, bulbs scales, bulbils, and bulblets. When grown from seeds, the plants take a longer time to bloom and in some cases as long as five to seven years. However, the plants raised from seeds are disease-free unlike those grown from scales or bulbs. From a mature bulb, a few scales may be removed and planted in a fine soil-and-sand medium. Some species like *L.-tigrinum*, *L. sargentiae* and others produce small black or green button-like growths called bulbils in the axil of leaves, while sometimes bulblets are formed in the stem-rooting lilies just below the surface of the soil. These bulbils and bulblets are also used for propagation.

Lifting: In lilies, the bulbs are not lifted from the ground or pots every year. Lifting and replanting of bulbs is usually done every four years as the flowering is poor in the following year and the plants take about a year or so to recover from the disturbance. The older bulbs are divided before replanting them.

Diseases and pests: The common disease of lilies is the botrytis which is similar to the potato leaf blight and infects the leaf, stem and even the whole plant. Spraying bordeaux mixture or copper fungicide is effective in controlling the disease. The fusarium basal rot which results in the rotting of bulbs in another important disease. The affected bulbs should be uprooted and burnt and lilies should not be planted in the infected soil for four years or the soil should be sterilized with formalin before planting. Virus diseases are also serious in lilies and they produce spots, streaks or mottles on the leaves or bend the top of the plant. The infected bulbs should always be destroyed and only healthy bulbs planted. It is better to grow lilies from seeds than from bulbs to obtain healthy and virus-free plants.

GRAPE HYACINTH

Muscari botryoides

Other common name: Musk hyacinth

FAMILY: Liliaceae *ORIGIN:* Southern Europe

The plants are dwarf, having long, narrow, grass-like leaves and produce a spike of small globular flowers on the stalk well above the foliage. The spike of the blue flowers resembles a grape bunch and has a musky scent. There is also a white-flowered variety *(M.b. album).*

The grape hyacinth is suitable for growing in pots, rockeries and borders, particularly in clumps. It is also ideal for growing indoors.

The bulbs are planted about 8 cm deep and 10 cm apart. The best time for planting is October on the plains as well as on the hills. They flower early in February-March both in the plains and in the hills. The plants thrive best in a light, well-drained soil to which plenty of humus has been added, and a sunny situation, though they can tolerate shade to some extent. Once planted, the bulbs are left to grow and multiply and are not lifted or replanted for several years.

There are about two dozen species of Muscari which are grown in gardens, besides the common *M. botryoides.* Of these, the important ones are *M. armeniacum, M. tubergenianum, M. paradoxum* (Starch hyacinth), *M. plumosum* (Ostrich Feather hyacinth), *M. azureum, M. comosum* (Tassel hyacinth), *M. latifolium, M. moschatum, M. racemosum* and a few others.

DAFFODIL AND NARCISSUS

Narcissus species and hybrids

Other common name: Nargis

FAMILY: Amaryllidaceae *ORIGIN:* Northern hemisphere, Europe, British Isles, Canary Islands, Asia, North Africa

Daffodil is a common name given to the large trumpet varieties, while the short-cupped varieties are called the narcissus. However, both belong to the same botanical genus, *Narcissus.* The plant is short, about 45-60 cm tall, while some species are only 7.5 cm high, having green, narrow, grass-like leaves. The flower is borne on a long stalk. It consists of a narrow perianth-tube, its length depending upon the species and the variety, at the top of which there are six perianth segments (petal-like) and a corona or trumpet or cup projecting forward from the centre of the perianth. The colour of the perianth may be white or yellow and occasionally lemon or reddish. The size, shape and colour of the corona vary in different varieties. The corona may be large, trumpet-shaped, cup-shaped or almost flat. The shape may be cylindrical (trumpet-shaped), cup-shaped or bowl-like, with sharp-cut, rolled or serrated edges and the colour may be yellow, white, red or pink or a combination of two or more of these colours. In some varieties, the cup has a very thin yellow or red edge and in some cases the colour may extend half-way down the corona. The flowers are produced either singly or in clusters, varying from two to three flowers in the triandrus and the jonquil hybrids, to as many as ten or more in the tazetta. Most of the flowers are strongly scented as in the Tazetta, Jonquil and Poeticus hybrids, while in some like the Cyclamineus and the Triandrus hybrids, there is no scent and in others they may be mildly fragrant.

Narcissi and daffodils are planted in beds in the open or in pots. They are also suitable for forcing and for indoor cultivation. For cut flowers, they are the best of garden flowers. They can be effectively planted in formal beds and borders or in drifts in the grass or among shrubs and tall trees for naturalizing in the wild garden, particularly when grown in scattered groups. They can also be grown along the edge of paths or lawns.

The dwarf-growing species like *N. jonquilla, N. bulbocodium, N. triandrus, N. cyclamineus* and a few others are ideal for growing in the rockery. A few varieties like the Paper White, Grand Soleil d'Or, Beersheba, Cragford, Geranium and others are excellent for growing indoors in bowls or vases.

Cultivation: A good loam soil with plenty of humus is ideal for growing narcissi and daffodils. The beds should be dug about 60 cm deep before planting. If the soil is light, cowdung manure or compost should be added to it. To a heavy soil coarse sand should be added to ensure proper drainage. Bonemeal, about 60 gm per sq. metre, can be applied preferably before planting, and just before the commencement of flowering, an application of potassium sulphate, about 30 gm per sq. metre, is beneficial. Heavy manuring with nitrogen should be avoided as it would promote excessive vegetative growth and adversely affect flowering.

The best time to plant on the northern plains is October, while on the hills the planting can be done in September-October. The flowering takes place from December to March on the plains and from December to April on the hills. The bulbs are planted about 8-12 cm deep and the nose is covered with soil. There are different sizes of bulbs. A mother bulb is composed of a number of bulbs of all sizes which will produce 3 to 4 blooms, a double nose with two flowering bulbs in one outer skin giving two or sometimes more flowers and a round bulb which has no offset and seldom gives more than one bloom. The new growths called the offsets and the chips which are smaller do not produce any bloom in the first year.

After the flowering is completed, watering should be withheld. The leaves will turn yellow and die. The foliage should not be cut when it is green as it is harmful to the plants. Later when the leaves have dried, the bulbs should be lifted with the help of a fork. They should then be dried in the sun and stored in a cool and shaded place until the next planting. When the plants are grown in pots, the bulbs can be left there after flowering and the pot removed to a cool and shaded place, preferably under the shade of a tall tree and kept there until planting. On the hills the bulbs are generally not lifted and only after every three years or so the bulbs can be lifted, offsets removed and planted again to produce better flowering.

Indoor Cultivation: For growing them indoors, the bulbs are planted in pots or bowls. The planting mixture consists of equal parts of soil, sand and leaf-mould and half a part of crushed charcoal. The number of bulbs to be planted in a pot depends upon its size. About 6 to 9 bulbs can be planted in a 15-cm pot. The bulbs are planted with their tips protruding just above the surface of the soil but about 2.5 cm below the rim of the pot to allow room for watering. The pots are then kept in a covered box in a cool, dark and airy room and watered periodically. After about three to four months when 5-8 cm of top growth has appeared, the plants are first brought indoors to a warmer place for about a fortnight until the emergence of flower-buds and then transferred to a sunny window inside the living-room.

The bulbs are also planted in bowls which contain only bulb-fibre. In our country bulb-fibre is not available. We can use moist moss with a little charcoal or pebbles. In other countries the bulbs are also grown in water in a special type of glass containers called the Hyacinth Glasses which are used for growing hyacinths. While growing in pebbles or hyacinth glasses, the base of bulbs should be kept just above the surface of the water containing a few small pieces of charcoal in it. For growing in pebbles, first a little charcoal is placed in the bottom of the bowl and then a thick layer (4-5 cm) of sand is spread over it. The bulbs are placed on the sand and secured firmly by placing a few small pieces of stone around them and later the bowl is filled up with pebbles. The bowls are watered in such a way that the water reaches just below the base of the bulb but not above it.

The time of planting bulbs indoors is the same as that adopted for doing so in the open. It is always a good practice to plant the bulbs at intervals of 15 to 20 days to ensure a longer blooming period.

Classification of Species and Varieties

The Royal Horticultural Society, England, which is the international registration authority for narcissi and daffodils, has adopted the following classification. There are eleven divisions. A few important varieties in each division are mentioned within brackets.

Division 1—Trumpet
- (a) Yellow trumpet (King Alfred)
- (b) Bicolor trumpet (Queen of Bicolors)
- (c) White trumpet (Beersheba, Mount Hood)

Division 2—Large-cupped
- (a) Yellow perianth, coloured cup or corona (Armada, Fortune, Galway)
- (b) White perianth coloured cup or corona (Brunswick, Kilworth, Fremoy.
- (c) White perianth, white cup or corona (Garnlough, Ice Follies)
- (d) Any colour combination not falling in (a), (b) or (c) above

Division 3—Small-cupped
- (a) Yellow perianth, coloured cup or corona (Chungking)
- (b) White perianth, coloured cup or corona (La Riante Mahmoud)
- (c) White perianth, white cup or corona (Polar Ice, Portarush)
- (d) Any colour combination not falling in (a), (b) or

(c) above

Division 4—Double (Mary Copeland, Camellia, Texas, White Lion)

Division 5—Triandrus (Rippling Waters, Silver Chimes)

Division 6—Cyclamineus (Charty May, February Gold, Jenny, Peeping Tom)

Division 7—Jonquilla (Baby Moon, Sweetness, Trevithian)

Division 8—Tezetta (Cragford, Geranium, Cheerfulness, Scarlet Gem)

Division 9—Poeticus (Actae, Recurous)

Division 10—Species and wild forms and hybrids (*N. bulbocodium, N. minimus, N. cyclamineus,* N. *triandrus* Rip Van Winkle)

Division 11—Miscellaneous—not falling in any of the foregoing divisions (Nylon).

GUERNSEY LILY

Nerine sarniensis

Other Common name: Nerine

FAMILY: Amaryllidaceae *ORIGIN:* South Africa

The leaves are long, narrow and strap-shaped. The flowers are borne on 45-60 cm long stalks in umbels of 6 to 12 flowers. The corolla is divided into six narrow, wavy segments or petals. The flowers are deep carmine-red in colour and very showy. The plant is leafless at the time of flowering and the leaves appear after flowering. In other species, there may be leaves at the time of flowering. On the northern plains, it flowers during August-September, while on the hills it does so in September-October.

There is another species, *N. bowdeni,* which is early-flowering with soft pink or rose-coloured flowers. Several beautiful hybrids are also available, such as Bowdeni Pink Triumph.

Nerine is suitable for growing in pots. It is also ideal for indoor cultivation.

The bulbs are planted in December-January on the northern plains and in August-September in the hills. While planting the bulbs, their neck should be above the surface of the soil. The potting mixture contains loam, coarse sand, cowdung manure or leaf-mould in equal proportions. On the hills, the watering is withheld in April-May to ripen the bulbs thoroughly and this can be done during winter months on the plains after the flowering ceases. The plants like to become potbound and the bulbs should not be disturbed for several years. The plants flower best when they have developed a mass of bulbs that are crowded together. They thrive well in a light and well-drained soil and a sunny position, preferably along the southern wall.

STAR OF BETHLEHEM

Ornithogalum umbellatum

FAMILY: Liliaceae *ORIGIN:* Europe, Britain and North America

The leaves are long and narrow. The star-shaped small flowers which are borne in umbels are white inside and green-striped on the exterior. The two other commonly grown species are *O. nutans* with white flowers that are green on the outside and *O.pyramidale* having white flowers with a green back borne on long stems which are ideal for cutting.

Ornithogalum can be grown in pots, borders, grass and between shrubs. It may also be grown in a rockery. When grown in masses in grass or a shrubbery, it looks very attractive.

The bulbs are planted about 10 cm deep and 5-8 cm apart. The best time of planting is October both on the plains and on the hills. The plants flower during February-March on the northern plains and from April to June on the hills. The plants multiply quickly from offsets or bulblets which can be used for propagation. They thrive best in a rich and well-drained soil and a sunny situation, though they can tolerate partial shade.

OXALIS

Oxalis species

FAMILY: Oxalidaceae

The commonly grown species are *Oxalis boutiei* with rosy pink flowers, *O. deppei* from Mexico commonly called "The European Lucky Clover" or "The American Shamrock", having small rosy red blooms with clover-like leaves curiously marked with bands of purple, *O. variabilis* producing small shell-pink flowers, *O. cernua* with black spotted foliage and bright yellow flowers, *O. cuprea* having glaucous green leaves and golden yellow blooms and *O. floribunda (O. rosea)* bearing rose-coloured flowers. *O. cuprea* (golden yellow) is commonly grown in Delhi and neighbouring areas.

The plants are trailing in habit with clover-like three-lobed leaves. In the species *O. tetraphylla,* the leaves are four-lobed and it bears purplish-pink flowers in summer and the rainy season unlike other species which flower during the winter months on the plains. On the hills, the flowering takes place from June to August.

Oxalis is ideal for growing in a rockery, in the shrubbery and under tall trees. It can also be successfully grown in pots. It thrives best in a cool, moist and shaded or partially shaded situation and likes a richly-manured but well-drained soil. The plants grow exceedingly well when grown in a soil with leaf-mould added to it.

Oxalis is a tuberous-rooted species and can be propagated from bulbs. A few species can also be grown from seeds. The planting of bulbs or sowing of seeds is done in October on the plains. On the hills, the bulbs are planted in September and the seeds are sown in March-April.

TUBEROSE

Polianthes tuberosa

Other common name: Gul-e-shabu

FAMILY: Amaryllidaceae *ORIGIN:* Mexico

The leaves are long, narrow, linear and grass-like. The flowering stalk (about 90 cm) emerges from the centre of the cluster of leaves. The flower-buds are tubular and the flowers may be single or double, pure white and highly fragrant. The variety "Pearl" is double-flowered. Usually, the single-flowered varieties are more fragrant than the double-flowered ones.

Tuberose can be successfully grown in pots, beds, borders and shrubberies. It is also useful for cut flowers which last long. Tuberose flowers are highly prized for their delightful fragrance. Tuberose thrives best in West Bengal, Pune, Bangalore and Madurai. Its flower spikes are commonly sold in Calcutta, Bombay, Bangalore, Delhi, Pune and Madras.

The bulbs are planted in October on the plains and in May-June on the hills. The flowering takes place during summer and the rainy season (April to September) on the northern plains and in May-June on the hills. The plants thrive well in a well-drained soil and a sunny situation. They can also be grown in partial shade. The potting mixture contains two parts soil and one part of equal proportions of leaf-mould and coarse sand. After flowering, the flowering stalk should be cut down to encourage production of more blooms in succession. The bulbs are left undisturbed in the ground and occasionally they are separated and replanted.

TURBAN BUTTERCUP

Ranunculus asiaticus

Other common name: French Ranunculus

FAMILY: Ranunculaceae *ORIGIN:* Orient

The plants are dwarf (30-45 cm) with beautiful cut foliage. The flowers are about 4 cm across, yellow and double. The modern garden varieties produce flowers of a wide range of colours including yellow, red, orange, white, scarlet, purple, etc. The common types are the Turban, Turkish and Persian Ranunculi. A new strain is the Peony-flowered Ranunculus *(R. grandiflora)* which is long-stemmed and very free-flowering with flowers of almost all colours.

Ranunculus is well suited for growing in pots and beds and for cut flowers.

Its tubers have claw-like fangs. While planting, the claws are put downwards. The best time for planting is October on the northern plains and March-April on the hills. The tubers are planted 8-10 cm apart with claws downwards and the crown of the tuber kept 5 cm under the surface of the soil. The flowering takes place in February-March on the plains and in May-June on the hills. The plants thrive best in those areas in the plains which are sufficiently cool and dry in winter, such as Delhi and adjoining areas where they flower freely. The tubers should be lifted after flowering and replanted in the next season. However, on the hills the tubers may be left in the ground, particularly in those regions where the climate is not very severe, otherwise they must be lifted from the ground and stored until the next planting season. A well-drained soil with plenty of humus in it is suitable for growing ranunculus. The plants need frequent watering during dry weather.

JACOBAEAN LILY

Sprekelia formosissima

FAMILY: Amaryllidaceae *ORIGIN:* Mexico and Guatemala

The plants are dwarf, about 30-45 cm tall, with long, narrow, grass-like leaves. The flowers are borne on long stems. They are large, attractively shaped like a cockade with golden stamens in the throat and of brilliant crimson colour and borne vertically at the end of a long stalk.

The flower is excellent for growing in pots. The bulbs are planted in February-March on the plains and in March-April on the hills. The plants flower during summer and the rainy season on the plains, while on the hills the flowering takes place in June-July. The plants should be watered frequently during the period of growth. After flowering, watering should be withheld to bring the bulbs to a dormant stage.A top dressing of well-rotted cowdung manure should be given annually to each pot. Repotting may be done after every three or four years.

THE TIGER FLOWER

Tigridia pavonia

Other common names: Tiger Iris, Shell Flower of Mexico

FAMILY: Iridaceae *ORIGIN:* Mexico

The plants are tall with forked and leafy stems and long plaited leaves. The flower has three larger outer petals with three short inner ones and a violet base. The yellow centre of the flower is spotted purple like a tiger's skin. In some other varieties and species, the centre of the flower is white with carmine spots, golden-yellow spotted scarlet, scarlet with crimson spots or of a few other colour combinations.

It is successfully grown both in pots and in beds. The bulbs are planted 8-10 cm deep in March-April on the plains as well as on the hills. The flowering takes place during July-August. On the hills, the bulbs should be lifted after flowering and stored until the next planting. The plants thrive best in a well-drained and rich soil and a sunny situation. They require frequent watering during growth.

MONTBRETIA

Tritonia aurea (Syn. *Crocosmia aurea)*

FAMILY: Iridaceae *ORIGIN:* South Africa

The plants of *Tritonia aurea*, the earliest kind of Montbretia, produce blooms of pale orange-yellow on short stems. The modern varieties of Montbretia, which are taller having large-sized flowers borne on long stems with a long flowering season and of various attractive colours of scarlet, orange, lemon, yellow, gold, pink and cherry shades, have been evolved by hybridization of different species. The flowers are bell-shaped with five petals borne in sprays on long branching leafy stems. The foliage is sword-like. The Montbretia has now several beautiful modern hybrid varieties. A rose-coloured variety, *Tritonia rosea,* is the only variety in cultivation which produces soft rose flowers.

Montbretia is ideal for cut flowers and general garden decoration and for growing in borders and shrubberies or under trees.

It grows best on hills and on the northern plains also, particularly in Delhi and the adjoining areas, where it flowers but not so profusely as on the hills. The plants thrive well on a well-drained loam soil and a sunny situation. However, it can tolerate shade to a great extent and is often planted under trees. Application of leaf-mould to the soil is beneficial. On the northern plains, the planting can be done in October, while on the hills the best time for planting is February-March, though it can also be planted successfully from October to March. The corms are planted about 8 cm deep and 51 cm apart. The flowering takes place during summer both on the hills and on the plains. The corms are generally not lifted. However, after every three or four years or so the corms may be lifted and divided and replanted to encourage better flowering.

Another genus *Crocosmia* belonging to the same family *Iridaceae* to which the genus *Tritonia* (Montbretia) belongs also produces Montbretia-like flowers. *Crocosmia masonorum,* which is also a native of South Africa, produces in a long spray flowers of a bright orange-flame colour with prominent stamens. It is excellent for cut flowers.

TULIP

Tulipa species and hybrids

FAMILY: Liliaceae *ORIGIN:* Europe, Western and Central
Asia and North Africa

Cultivated tulips first came to Holland from Turkey during the middle of the sixteenth century, where they were cultivated for long. Today Holland is the largest producer of tulips in the world and she is the principal supplier of tulip bulbs to all parts of the world. Every year in the spring foreign tourists in large numbers visit Holland to see the magnificent tulip fields. The economy of the bulb and flower growers of Holland is mainly based upon tulips.

There are various classes of garden tulips that are in cultivation now. These are the early-flowering tulips like Duc van Tol, Single Early, Double Early, the mid-season, such as Mendal and Triumph, the late-flowering tulips like Darwin, Darwin hybrids, Breeders, Lily-flowered, Cottage, Rembrandt, Bizarre, Bijbloemen, Parrots, Double Late and Species tulips and their hybrids. Besides differences in the time of flowering, the various classes of tulips also differ in their size, shape and colour of flowers. New varieties are raised from seeds and in some cases they have arisen as "sports" in nature. There are several varieties in each class of tulips. A few important species of *Tulipa* which are generally grown in a rockery or for naturalizing are *T. biflora, T. chrysantha, T. clusiana, T. hageri, T. kaufmanniana, T. greigii, T. eichleri, T. fosteriana, T. montana, T. persica, T. praestans, T. tarda, T. turkestanica* and a few others.

The plant possesses three or four oppositely-placed smooth, long, lanceolate, pointed, green leaves, from the centre of which arises the flowering stalk with an individual flower borne at the terminal end. The flower is shaped like a cup or egg with six petals. The flowers are self-coloured or a combination of two or more colours and some are striped and marked with contrasting colours. The colours of flower range from white to black including several like red, scarlet, crimson, terracotta, orange, pink, purple, violet, chocolate, brown, cherry, magenta, salmon, carmine, rose, cream, yellow, apricot, lilac, mauve, blue and various other hues. With such a bewildering range of most attractive flower colours and with its exquisite flowers, the tulips rank high among garden flowers.

Tulips are excellent for cut flowers and for growing in beds, borders and pots and also for indoor cultivation in pots, bowls and window-boxes. They are suitable for naturalization in grass under the trees and shrubs. A few dwarf-growing species can be grown effectively in a rockery.

In our country tulips thrive well in Kashmir, the Kulu Valley and other similar hilly regions but do not grow satisfactorily in the plains. Sometimes, a few poor specimens of tulips flowering in pots can be seen in the flower shows of Delhi. The bulbs brought from the hills or imported from abroad flower the first year under Delhi conditions but perish afterwards. A few species, such as *Tulipa stellata* and *T. aitchisonii*, are natives of the Himalayas. *T. stellata*, commonly known as the Star Tulip, is ideal for growing in rockeries, pots or bowls. It is also suitable for growing indoors and for naturalizing. It flowers under Delhi conditions. The flowers are small, white with a reddish exterior and appear attractive when grown in a mass.

The bulbs are planted in October in Delhi and in October-December in the hills. In Delhi, the flowering takes place in February-March and from March to May in the hills. The bulbs are planted about 8-10 cm deep and about 15 cm apart. The plants grow well in a well-drained and rich soil and a sunny situation. They do not require much manuring. The bulbs should be lifted from the ground every year to obtain better flowering the following season. The bulbs are lifted when the leaves turn yellow and die.

ARUM LILY

Zantedschia aethiopica (Richardia)

Other common name: Calla Lily

FAMILY: Araceae *ORIGIN:* South Africa

The leaves are large, dark green and arrow-head shaped, while the flowers are attractive spathes of white colour. There are also species with yellow *(Z. elliottiana)* and pink spathes *(Z.rehmanni)* which are natives of the Transvaal and Natal, respectively. Arum lily is suitable for cut flowers and for growing in pots. It can also be grown indoors.

The plants are propagated by division of rhizomatous roots. The best time for division is October. The flowering takes place towards the end of March.

It thrives well in Ootacamund and other hills of South India as well as on the northern hills. Its growth in the plains is not satisfactory. However, it grows well in Bangalore where the climate is mild.

The plants grow well in cool and moist conditions. They like a well-manured soil and full sunlight.

ZEPHYR LILY

Zephyranthes species

Other common name: Flower of the West Wind

FAMILY: Amaryllidaceae *ORIGIN*: South America

The plants are short-growing (15-20 cm) with very narrow grass-like leaves and crocus-like flowers borne on long stalks. The commonly grown species are *Zephyranthes candida* with white flowers, *Z. rosea* with pink blooms and *Z. sulphurea* having yellow flowers. Another species *Z. grandiflora* has large rose-coloured flowers. There is also a hybrid Cooperanthes, resulting from a cross between *Cooperia* and *Zephyranthes*. Its flowers resemble those of Zephyranthes and it is a very hardy type blooming for a longer period and grows well even under the least favourable conditions.

Zephyranthes is ideal for growing in grass, under trees and in front of a shrubbery. It is also good for edging and for growing in borders and along paths or edges of a lawn. When grown in a mass, it looks very attractive. It can also be grown in pots and rockeries.

The bulbs are planted during March-April or October both on the plains and on the hills. The depth of planting the bulbs is about 5-8 cm and the same is the distance between two bulbs. When grown in pots, about 6 to 8 bulbs can be planted in a 20-cm pot. The potting mixture contains two parts soil and one part each of sand and leaf-mould. The plants thrive well in a well-manured soil and a sunny situation. They can also be successfully grown in partial shade. The flowering takes place during late summer and the rainy season in the plains and in the rainy season and autumn on the hills. The flowers open in the morning and close in the afternoon. The bulbs multiply fast and they are not lifted from the ground. However, after every three years or so, they may be divided and replanted to avoid overcrowding and to encourage better flowering.

(e) CANNA

Canna species and hybrids

Other common name: Indian Shot

FAMILY: Scitamineae *ORIGIN:* Tropical America and Asia

A species of Canna, namely, *Canna indica,* is a native of Central and South America and the West Indies. It is tall-growing (1.5-2 m) having yellow and red flowers. There are several other species also which are in cultivation. The species *C. speciosa* is a native of India and the East Indies. The modern varieties of Canna are hybrids derived from crosses between different species and varieties. A commonly known group of such hybrids is the Crozy hybrids. In general, there are two types of Canna, namely, the Orchid-flowering and the Truss-flowering. The former, in which all the flowers in a head do not open simultaneously unlike the latter, is not much preferred. The modern hybrid varieties range in plant height from 45 to 180 cm and their colour of flower varies from white to dark red including cream, yellow, pink, orange, scarlet and various shades of these colours. An extra dwarf variety growing only 30 cm tall is also available.

The following are some of the important varieties in the different colour classes:

1. **Tall varieties** (1-2 m)

White : Radio, White Queen

Yellow : Aurora Borealis, Buttercup, Canary Bird, Masterpiece, Enchantress

Orange : Copper Giant, King Humbert, Rosamund Coles, American Beauty, Sunset, Tango, Wyoming

Pink : Alipur Beauty, Candilabra, Apricot King, City Range of Portland, Coquette, Damodar, Dorris, Louis Cayeu, Mammie, Mrs. Herbert Hoover, Mrs. Pierre S. DuPont, Prince of Wales, Rosea Gigantea

Red and Scarlet : Assant, Carmine King, Cleoppatra, Statue of Liberty, Mohawk, The Ambassador, The President

2. **Dwarf varieties** (45-105 cm)
   - *Pink* : Centenaire Rozain, Departing Day, Hungaria, Orange King, Susquehana
   - *Orange* - Orange Glory, Orange Plume, Fairy, Cleopatra
   - *Yellow* : Star Dust, Apricot
   - *Red* : Queen Charlotte, Saint Tropez (red with yellow borders)

In some varieties the flowers may be spotted or streaked and in a few the petals may be bordered with striking colours. The leaves in some varieties are bronze in colour or variegated.

1. *Yellow spotted red or scarlet* : Cyclops, Gladiator, Mikado, En Avant, Percy Lancaster, Yellow King Humbert, Mrs. Lancaster
2. *Orange-scarlet with red markings* : King Humbert, Orange Glory (orange splashed yellow)
3. *Deep reddish-orange with deep orange-yellow border* : Rosamund Coles
4. *Red with yellow border* : Queen Charlotte (dwarf, 45-60 cm)
5. *Bronze leaves* : King Humbert, La Gloire, Black

Knight

6. *Variegated leaves :* Trinacria variegata (yellow flowers, variegated leaves, dwarf, 60-90 cm)

Uses: Canna is one of the best garden flowers suitable for growing in beds. It is most attractive when grown in masses in large beds and therefore best suited for planting in big home gardens and public parks and gardens. The canna beds are generally located at the edge of a lawn or in the lawn, preferably against the background of a hedge. The different coloured varieties are planted separately and sometimes different colours may be grouped together in the same bed, keeping in view their plant height, colour and time of blooming, to produce an attractive and bold effect. The size of beds depends upon the space available for planting and their shape may be rectangular, square, round, oval, triangular or hexagonal. The dwarf varieties can be successfully grown in large pots or tubs.

Propagation : The plants are propagated from seeds or from division of rhizomes. The best time of planting is July before the onset of rains. However, planting can also be done after the rains. The beds are prepared in June by digging at least 61-90 cm deep and layer of 10-15 cm of well-rotten cowdung manure applied to each bed. The rhizomes are planted about 15 cm deep and 45 cm apart in rows spaced at the same distance. For better rooting and to avoid rotting, the rhizomes are placed above a layer of sand while planting. The plants flower on and off during the year but the best blooms are obtained from October to December and from April to June. To prolong the blooming, the faded flowers should be removed frequently.

After the first flush of flowering is finished in December, leaf-mould or cowdung manure should be applied to the beds to ensure good flowering in the second flush from April to June.

New varieties result by hybridization. For this purpose they are raised from seeds. Bud sports also produce new varieties. The seeds are of a small pea size and black in colour with a hard seed coat. The seeds are scarified by filing or by rubbing with a sandpaper or a small portion cut off with a sharp razor blade without injuring the embryo which is inside the seed. This treatment ensures better germination of seeds. Sometimes, soaking of seeds into water overnight or keeping them in cowdung before sowing is also useful in obtaining better germination.

Cultivation : The plants thrive best in a rich, well-drained and moist soil and a sunny situation. Heavy manuring should be avoided as it would encourage leafy growth and thus adversely affect the flowering. For growing in pots, the potting mixture consists of one part soil and two parts manure, preferably leaf-mould and half a part sand.

Every year the rhizomes should be lifted from the ground in June and given a rest before dividing and replanting in July. This encourages better flowering. After lifting, the rhizomes are kept covered under sand in a shaded place until replanting. The rhizomes may be divided before replanting. Canna is susceptible to frost and therefore on frosty nights the beds should be watered heavily. Mulching the beds with leaf-mould is also useful. When the plants get damaged by frost, it is better to cut them back to induce new growth.

(f) PERENNIALS

FAMILY: Eriaceae *ORIGIN:* China, Japan, Tibet, India & Burma

All azaleas belong to the *Rhododendron* species, *R. simsii, R. indicum, R. japonicum (R. molle), R. obtusum, R. occidentale* and *R. sinensis.* They are small shrubs which do best on the hills. On the plains the plants do not grow so well but they flower in February-March when brought from the hills in September-October and grown in partial shade with great care. In Delhi it is possible to grow azalea in pots as a perennial successfully if the plants are protected from heat and sun during summer. There are several varieties of azalea and most of them are hybrids between different species. Both deciduous and evergreen azaleas are cultivated. Among the deciduous, the important types are the Mollis and Sinensis with large funnel-shaped flowers of attractive shades of orange, red, salmon, crimson, apricot and yellow, the Ghent varieties having trumpet-shaped single or double fragrant flowers and the Kaempferi hybrids with widely-opened flowers in shades of pink, rose and red. The popular evergreen types include *R.obtusum* with small magenta-coloured flowers, the Kurume or the Japanese azaleas possessing small white, mauve, pink, red, scarlet or carmine-coloured blooms and the Malvatica hybrids with larger flowers of similar colours as those of the Kurume azaleas. The Kurume or the Japanese azaleas are suitable for rock gardens. The Indian azaleas produce large, single and double flowers in various shades of pink and red and generally the colour of the flower is associated with white but not always so.

Azaleas are generally propagated by cuttings and they are not true to type when raised from seeds. The plants like sunlight, a cool temperature and an acidic soil. Feeding with a liquid manure and watering are regularly needed for good growth and flowering. After flowering, watering should be reduced and after the plant enters a rest period, it should be pruned back lightly and then given a mixture containing equal parts of soil and peat moss. On the plains, azaleas are grown in pots, while on the hills they can be planted in the ground also.

Bougainvillea: Fam. *Nyctaginaceae; Origin:* Tropical and Subtropical South America

Both in small and large gardens, the Bougainvillea is highly prized for its beauty and utility. It is named after Louis Antoine de Bougainvillea, a French navigator. Being a native of tropical and subtropical South America, it is well adapted to our climatic conditions.

When in full bloom, it is most enchanting and produces a riot of colour which lasts for quite a long time. With the commencement of winter during October when the breeze becomes cool and pleasant, the Bougainvillea comes into bloom. There is a second flush of flowering in summer but a few varieties like the Snow Queen and Snow White bloom only once during winter. Except a few ornamental flowering trees like the Gul Mohar *(Delonix regia),* Cassias, Jacaranda and Erythrina, there is no other garden plant which flowers so abundantly during the summer months when most of the gardens are devoid of colour.

It can be used both as a shrub and as a climber. This shrub forms an attractive lawn specimen and is often grown as a standard. Two or three varieties having flowers of different colours may be budded on the same standard to produce a multicolour effect. A hedge of Bougainvillea is quite common and colourful. It can also be trained on a tall tree, on the trunk of a dead tree or on a trellis or screen. It is ideally suited for growing in large tubs or pots, particularly those made of cement.

The Bougainvillea can be propagated from cuttings, layerings or buddings. The plants are usually budded or layered from February to April, while cuttings can best be planted in June-July after pruning. A few varieties like Mary Palmer which are difficult to propagate from cuttings can be raised easily from buddings. For rootstock, the variety Dr R.R. Pal can be used successfully. Many varieties fail to set seeds but comparatively seed-setting is better in Bangalore, Mysore and Hyderabad than in Delhi. Seeds are useful for raising new varieties. There are several varieties which have been raised from seeds.

Planting time : The best time to plant it is from July to September and planting should be avoided during winter when the mortality is high and the growth poor. The plants may be grown about 1.5-2.5 m apart but in a hedge a closer distance may be given. The pits for planting should be about 90 cm in diameter and 75 cm deep. At the time of planting, about three to four baskets of well-rotted cowdung manure may be added to the soil in each pit.

Pruning: The plants should be pruned in June soon after they have finished their flowering to obtain better blooms in the next season. The plants growing in tubs or pots are pruned harder than those in the ground with a view to maintaining their shape and restricting growth. After pruning, about two to three baskets of cowdung manure should be applied to each plant followed by copious watering.

The plants should receive full sun and must be grown in a well-drained soil to produce an abundance of blooms. During peak flowering, watering should be restricted, otherwise the flowers will fall off quickly under heavy watering. The plants usually need more frequent watering during summer than in winter months. The young plants should be protected from frost during January. The Bougainvillea is a very hardy plant and is almost free from diseases and insect pests.

Four species : The varieties commonly grown in our gardens belong to four botanical species, namely, *B.glabra, B. spectabilis, B. peruviana* and *B. buttiana,* which differ from one another in some characters like growth habit, leaf shape and size, colour of bracts and habit of flowering.

The flowers in the Bougainvillea are usually referred to the three attractively coloured bracts and real flowers are small and tubular with a star-shaped apex that is often inconspicuous and borne in the centre of bracts. The colours of bracts are white, light mauve, magenta, pink, deep mauve, orange, yellow and red. Some of the outstanding varieties are Snow Queen (white), Begum Sikander (deep magenta edges), Shubhra (white), Killie-Campbel (magenta purple), Sanderiana (deep mauve), Splendens (deep mauve), Trinidad (pale mauve), Mary Palmer (bicoloured deep rose and white flowers on the same plant), Mrs. H. C. Buck (deep rose), Louis Wathen (orange), Enid Lancaster (orange), Lady Mary Baring (turmeric yellow), Mrs. Butt (deep crimson), Sonnet (light rosy purple), Spring Festival (medium magneta purple), Dr. R. R. Pal (brick red), Summer Time (bright red), Partha (two-colour bracts – orange and pinky purple), Tomato (terracotta), Sensation (deep magenta). Blondie (orange turning pink), Isobel Greensmith (red changing to rose) and Mahara (double, red). The varieties, Snow Queen, Trinidad and Tomato are early-flowering. A few varieties like Tomato, Mrs. H. C. Buck, Mary Palmer, Sonnet, Sanderiana, Rao, Shubhra, Mahara and a few others are excellent for growing in pots.

The variegated varieties having yellow, cream or white coloured patches on leaves are also becoming popular. The variety Thimma is a well-known variegated form of Mary Palmer. The other commonly grown variegated varieties are Rao, Archana (variegated Rose Ville's Delight), Marietta (variegated Mahara) and Louis Wathen variegated. The recent introductions are the multi-bracted varieties like Roseville's Delight, *Mahara* Cherry Blossom and Los Banos Beauty which are double-flowered. These numerous varieties which have arisen as a result of bud sports or from seeds produced through chance crossing in nature are very hardy, easy to grow, attractive and well adapted to various uses in the garden.

Camellia *(Camellia japonica):* Fam.*Theaceae; Origin:* Japan and Korea

There are several varieties of Camellia *(C. japonica)* and the most of the recent garden varieties are hybrids of crosses between *C. japonica* and *C. saluenensis (C. williamsii).* The flowers are single, broad and funnel-shaped and many varieties have double flowers in white or in different shades of pink. Another popular species is *C. sasanqua* which is late-flowering. The Camellia flowers in summer and autumn.

The plants thrive best on the hills, particularly at Ootacamund, Coonoor and Darjeeling, and do not grow successfully on the plains. They require a slightly acidic soil, plenty of humus, partial shade and a moist and cool climate for a good growth. The plants are propagated by stem-cuttings or by leaves having an axillary bud and a small portion of stem. The plants should be pruned back after flowering.

Chrysanthemum;Fam. *Compositae; Origin:* Europe, Asia, America and Africa; *Other common name:* Guldaudi

In popularity, chrysanthemums are perhaps next only to roses and have been in cultivation for more than 2,500 years. They have undergone remarkable changes as a result of artificial crossing and selection in their native countries like China and Japan as well as in England, France, the U.S.A. and Australia. There are thousands of varieties now in cultivation in different countries and more than 3,000 varieties are being grown in English gardens alone.

Classification: Chrysanthemum varieties are classified into seven main groups, namely, the Incurved (like a perfect ball), Reflexed (with drooping florets), Incurving (in which the petals incurve loosely and irregularly), Anemone (having single petals and a tubular central disc), Pompon (with very small-sized flowers), Singles (having a central disc and five petals or ray florets), Miscellaneous like Spider (with a hook at the tip of petals), Spoon (with a spoon-like tip of petals), Koreans (having small single or double flowers with a visible central disc) and Rayonnantes (having quilled petals).

There are numerous varieties of chrysanthemum, the flowers of which may be white, cream, yellow, red, terracotta, bronze, maroon, lilac, mauve, pink or purple. A few commonly grown varieties are Snowball (white, incurved), Sonar Bangla (cream, incurved), Rose Bowl (deep rose-pink, incurved), Alfred Simpson (crimson-red, bronze reverse, incurved), Pink Cloud (pink, incurved), Ajina Purple (rose-purple, incurving), Bronze Turner (bronze, incurving), Coronation Pink (pale pink, reflexed), Duke of Kent (white, reflexed), Mahatma Gandhi (Mauve, tabular, reflexed), Kasturba Gandhi (white, tabular, reflexed) and Valiant (large, white, reflexed). A few other important varieties include tubular, Kikubiori (large, yellow, incurved), Angel Bell (large, soft, pink, incurved), Shen Meigetsu (yellow, incurved), Grape Bowl (wine-red, incurving), Tokyo (white, spider), Rupasi Bangla (white, spider, dwarf), Flirt (deep maroon, double Korean type), Birbal Sahani (white, globular, pompom), Mountaineer (large, yellow, incurved), and William Turner (white, incurved). Several outstanding varieties of chrysanthemum have been selected at the National Botanical Research Institute, Lucknow (U.P.) for flowering in open during different months of the year. Free-flowering varieties requiring no pinching, disbudding or training are also available.

Cultivation: During early February, the plants are beheaded after the flowering is over by cutting the stem about 15-25 cm above the soil. After some time when new suckers appear at the base of the stool, these are separated and planted in small 10-cm pots. Each sucker has its own root. The potting mixture consists of one part each of sand, soil and leaf-mould and a trace of wood ashes.

The second potting is done at the end of April and the suckers are transferred to a bigger pot of 15 cm which is filled with a richer soil mixture containing one part sand, one part soil, two parts leaf-mould, a quarter part wood ashes and one tablespoonful of bonemeal. The third and final potting is done in August when the plants are shifted to 25-30 cm pots. The potting mixture consists of one part sand, one part soil, two parts leaf-mould, two parts cowdung manure, a quarter part each of small pieces of wood charcoal and wood ashes and two tablespoonfuls of bonemeal. During May and June, the young plants must be protected from strong sunshine and from heavy rain during the rainy season.

Sometimes young cuttings about 5-8 cm long are taken just above a node and the lower leaves removed before inserting them in pots containing sand. It is helpful to dip the cut end of these cuttings into a root-promoting hormone like Seradix B before planting. The cuttings can be taken in February or sometimes in July-August, particularly from the lateral growths in the leaf axils. The latter practice is recommended when we desire to multiply plants quickly from an individual plant of any important or rare variety or a variety which produces only a few suckers.

Stopping and disbudding: By late May or early June, the young plants are pinched (stopped) by removing the tip of the main stem at a time when the young lateral shoots or "breaks" are just appearing in the leaf axils. Stopping will induce lateral growths to develop from the leaf axils. The number of main stems one would like to keep can now be decided upon. Generally one, three or six stems are retained for obtaining exhibition blooms. At the end of each stem there develops the first crown bud which is allowed to develop and the lateral growths arising in the leaf axils are disbudded or removed. However, in Pompons, Singles, Koreans and

Sprays, no disbudding is practised. Sometimes in a variety the first crown buds are removed and the second crown buds secured to obtain flowers. These second crown buds in general produce smaller flowers but of a more intense colour particularly so in the pink varieties. The date of blooming depends mainly upon the time of starting the suckers or cuttings and dates of stopping and disbudding. In foreign countries the exact dates of stopping and disbudding have been ascertained for each variety to produce best quality flowers. The plants will need staking during October.

Manuring: Ammonium sulphate, about 30-35 gm can be mixed in two gallons of water and a pint of the mixture applied to each plant during July-August. Soon after the appearance of flower buds, sulphate of potash may be applied in the same way as ammonium sulphate. About one tablespoonful of superphosphate should be mixed in the soil at the time of final potting. Nitrogen promotes healthy vegetative growth, while potash helps in developing strong and stout stems and flowers and phosphorus produces a good root growth. Liquid manure is prepared by dissolving ½ kg of fresh cowdung in five gallons of water and after four or five days when it has fermented, it is diluted with water to a very light tea colour. Liquid manure can be applied once a week after the appearance of flower buds till the flowers are half open. Overfeeding is harmful and it can be judged by snapping a leaf into two. If the leaf is dark green and brittle and breaks into two clean halves, further feeding of plants should be stopped.

Watering: The young plants require frequent watering in summer but less during the rains. Over-watering should be avoided. By tapping the pots with a wooden hammer it can be judged whether these need further watering. The pot which sounds heavy indicates that it needs less watering, while the one with a clear sound will require watering.

Pests and diseases: The Chafer bettle grubs appear usually in July and August at the base of the pot and cause the wilting of plants. These grubs should be removed by hand and destroyed. It is also useful to mix a little 5 per cent BHC and DDT dust mixture in the soil. The other insect pest is the aphid which appears in the cold months and sucks the sap from the leaves. Spraying Malathion, 2 ml in one litre of water, is effective in controlling aphids.

Among diseases, wilt and powdery mildew are important. The wilted plants should be uprooted and burnt as soon as they appear. To control powdery mildew, the white mould on leaves, dusting with sulphur is useful.

Fuchsia *(Fuchsia magellanica, F. coccinea and F. fulgens);* Fam. *Oenotheraceae; Origin:* Central and South America and New Zealand.

There are several species and varieties of *Fuchsia.* Most of the garden varieties have arisen as hybrids from crosses between the species *F. fulgens. F. coccinea* and *F. magellanica.* A few species and varieties are trailing and hence suitable for growing in hanging-baskets, such as *magellanica gracilis,* Mureil San Francisco, etc. The species *F. arborescens* is a low-growing tree (6-7.5 m) with small red-coloured and scented flowers borne in abundance on erect panicles. Another shrubby species having a semi-climbing habit is *F. corymbiflora* with larger leaves and long tabular scarlet-coloured flowers.

The plants of Fuchsia are shrubby in habit and produce attractive drooping flowers which are like a lady's ear-drops. The sepals and petals are usually of two different colours, such as, white and red, red and purple, lilac and red, salmon and orange-scarlet, white and pink or purple, etc. The flowers may be single or double. Fuchsias are ideal for growing in pots, hanging-baskets (trailing varieties), troughs, planters and window-boxes and in shrubberies and wild gardens.

They do not thrive well on the northern plains of our country but grow exceedingly well on the hills, both in the north and in the south, as well as in areas having a mild climate like Bangalore and Mysore. However, the plants brought from the hills during September-October will flower on the plains in March-April. The plants need cool and moist conditions for a good growth and after that (January-February) they are pruned back to induce new and balanced growth. The plants are propagated by cuttings and from seeds. For evolving new varieties, the plants are raised from seeds.

Geranium *(Pelargonium zonale* and other species); Fam. *Geraniaceae*

The Geraniums are botanically known as *Pelargonium* species, particularly *P. zonale.* There are four main groups of Pelargoniums, namely, Zonal varieties of Geranium *(P. zonale),* Ivy-leafed varieties *(P. peltatum),* Show or Fancy types *(P. - domesticum)* and Scented-leafed varieties. Each group has several varieties. The Zonal types are the most popular kinds which are characterised by the presence of a darker zone of horse-shoe shape on the foliage which is roundish with wavy edges covered with fine hairs. There are varieties with variegated leaves also. The flowers are round, flattish and single or double in various colours like red, pink, scarlet, crimson, purple, salmon, vermilion, etc. The Ivy-leafed Pelargoniums having trailing stems are suitable for hanging-baskets and window-boxes. In the Ivy-leafed group there are some varieties with variegated foliage also. In the Show and Fancy species, the flowers are funnel-shaped unlike those in the other species and the leaves are palmate and toothed. The Scented-leafed Pelargoniums have either lemon or peppermint scent in their foliage. The species *P. graveolens* and rose-like scent, while *P. fragrans* has nutmeg scent and *P. tomentosum* has peppermint scent. Several of these scented-leafed Pelargoniums also produce attractive flowers. Hybrid Geranium(F$_1$ Hybrid) which can be grown from seeds are also available. These are dwarf, vigorous growing and very floriferous.

The Pelargoniums thrive best on hills or in areas having a mild climate like Bangalore and Mysore. In the plains of north India, they do not grow so well and often die during summer or the rainy season. Kept protected with great care under shade, the plants may survive for a few seasons. However, there are a few hardy varieties of the Zonal Pelargoniums that can survive a summer and a monsoon on the plains. The plants brought from the hills during September-October grow well on the plains and flower from February to March or April.

The Pelargoniums are grown in pots or in the ground but on the plains they are best grown in pots. The plants are propagated by terminal stem-cuttings or from seeds. The Pelargoniums are excellent for growing indoors. They require full sunlight, plenty of water, a cool temperature and a well-drained soil.

JASMINE

Jasminum species

Other common names: Bela, Champa, Chameli Jooee,
Motia, Mogra
FAMILY: Oleaceae *ORIGIN:* India, China, Burma, Australia
and S.E. Europe

About 200 species of *Jasminum*, both climbing and trailing of shrub with erect habit, are found in temperate, tropical and sub-tropical regions of the world. Several species of *Jasminum* including many important cultivated ones are natives of India.

The jasmines are highly prized for their fragrant flowers which are used for the preparation of perfume. They are grown commercially in our ~~country fo~~r the extraction of the essential oil for perfume and for cut flowers which are commonly used for making garlands and "veni", the latter being used for adornment of hair by women, particularly in the southern parts of the country. In the States of Tamil Nadu, Karnataka and Andhra Pradesh, jasmine is cultivated as an economic crop for cut flowers. It is estimated that about 12,500 kg of cut flowers of jasmines are sold per day in the important flower markets in this country, such as Bombay, Calcutta, Madras, Delhi and Bangalore. In the garden the jasmine is raised as a dwarf-growing shrub and a few species are grown as climbers. In a home garden, they are generally planted near the house, particularly adjoining the bedroom and along paths so that the fragrance of their flowers may be best enjoyed from close quarters.

A few important species of *jasminum* which are mostly natives of India and China and commonly grown in the garden are mentioned below. The classification of the *Jasminum* species is, however, confusing.

J. officinale, known as the Common Jasmine, from north India, China and Persia is a semi-evergreen or deciduous self-supporting climber growing as high as 9 m. Its glossy leaves have 2 to 3 pairs of leaflets with a larger terminal leaflet. The flowers are white, star-like in shape with 4 to 5 petals, very fragrant and borne in 3 to 8 flowered terminal clusters. The flowers are used for the extraction of perfume. There is a floriferous variety known as *affine* with larger flowers. It flowers during the rainy season (July to October).

J. grandiflorum, from the subtropical Himalayas, is a climber, popularly known as the Royal, Spanish or Catalonian Jasmine. It is also called *Chameli* and *Janti* in Hindi and Bengali, respectively. The leaves have 5 to 7 leaflets and the flowers are white, similar to those of *J. officinale* but larger in size. It is one of the best species of *Jasminum* and is commonly cultivated for the extraction of perfume. The flowering occurs in the summer months (March to June).

J. sambac, the Arabian Jasmine, which is a native of India, is a low-growing evergreen shrub with almost sessile leaves having wavy margins. It can also be trained as a climber. The flowers are white, single, semi-double or fully double, highly fragrant and borne in 3 to 12 flowered clusters. The double-flowered varieties are commonly called the *motia* or *mogra* in north India. In south India, the semi-double type is known as *donthara malle,* the fully double small-flowered as *gundu malle* and the large double or the Tuscan or the Grand Duke of Tuscany as *boddu malle.* These are known as *bela, khoya, motia* or *mogra* (large, double), *moturia* (semi-double),*rai* (largest of all, double) and *madanban* (or *Rai* Japanese) in West Bengal. This species is commonly cultivated in the States of Tamil Nadu, Karnataka and Andhra Pradesh for cut flowers, particularly the young flower buds. It produces several flushes of blooms in a year, but flowers profusely during summer and the rainy season. *J. auricūlatum* from India is commonly known as *jooee.*It is a creeper with simple smooth leaves or sometimes with three small leaflets. The flowers are white and borne in many-flowered clusters. Both single-and double-flowered varieties are available.

J. primulinum is an evergreen rambling species from China which has three leaflets in each leaf. The solitary flowers are produced freely on short branches. The colour of the flowers is bright yellow but unfortunately there is no scent in the flowers. It flowers during the winter season.

J. humile is popularly known as the Italian Jasmine or *Swarna chameli.* It is a native of tropical Asia and is also found in South-eastern Europe. The leaves have 1 to 3 pairs of leaflets. The flowers are yellow in colour and mildly fragrant with five petals and borne in 2 to 4 flowered clusters. The flowers are produced during the winter months.

J. angustifolium is popularly known as *malika.* It is a dwarf shrub with white, star-like and fragrant flowers. The flowering takes place from November to February.

J. paniculatum is commonly known as China *Jooee.* It is a creeper with white fragrant flowers.

J. floridum from China is an evergreen rambling species bearing trifoliate leaves and golden yellow flowers with five petals in terminal many-flowered clusters. It is also known as *Swarna jooee* or Golden Yellow *Jooee.*

J. pubescens is a native of India and China. It is a dwarf shrub with rambling growth and produces large white flowers very freely during winter. There is a veriety, *J. pubescens* var. *rubescens,* which has large white flowers with a pink underside. In Bengali it is known as *kund.*

J. arborescens, popularly known as *Naba mallika,* is a dwarf shrub having white fragrant flowers. The flowering takes place during the winter season and continues till the beginning of summer.

There is also an unidentified species of *Jasminum,* commonly known as *Sultani jooee* or *kund,* which is popular in Calcutta. It has shining dark green foliage and very fragrant white flowers with purple on the underside of two petals and tube and the buds are also purple in colour. The flowering takes place almost throughout the year but is best in February.

Propagation: The jasmines are commonly propagated by cuttings of almost mature wood and by layers. The best time for propagation is the rainy season.

Cultivation: Planting can be done in the rainy season. The dwarf shrub-like *J. sambac* is planted about 1-1.5 m apart, while the creeper may be grown about 3.5 m apart trained on arbours, arches, pergolas, screens or walls. *J. sambac* can also be grown in large pots. The potting mixture contains two parts soil, one part cowdung manure and some sand.

In Tamil Nadu, Mysore and Andhra Pradesh where Jasmines, particularly *J. sambac*, are commercially cultivated for cut flowers, watering is withheld in the end of November to bring the plant to rest and shed its leaves. Sometimes the foliage is also removed by hand. The shoots are also pruned to half their length in January and cowdung or farmyard manure at the rate of about 10 kg per bush is applied after exposing the roots for a few days. The watering of plants is started slowly and later increased after the appearance of flower-buds. Watering is withheld after each flush of flowering until fresh buds appear again. The flowering in *J. sambac* is best during summer, particularly in June-July. The creepers bloom for a longer period or almost throughout the year. In it the flowering takes place in flushes at intervals of one week. The yield of flowers is about 1,000 to 1,500 kg per acre or 350 to 500 kg per hectare. The climbing types yield a little higher, about 2,000 kg per acre or 650 kg per hectare.

ORCHIDS

Orchids (several genera and species)

FAMILY: Orchidaceae

Among native flowers, orchids are most important and have been introduced into several countries from India. The Indian species of orchids have been utilised by orchid breeders abroad for crossing with other species to produce some very attractive hybrids. Several species of orchids are found growing wild in forests in the Himalayas, particularly in the eastern parts like Darjeeling, Sikkim, Bhutan and Nepal, as well as in the Assam hills, the Western Ghats, Kodaikanal and other areas. Orchids are also natives of the other areas of the world like Burma, Sri Lanka, Java, Singapore, Borneo, Thailand, Hawaii, New Guinea, South Africa, Australia, the U.S.A., Mexico, South Africa, etc.

They can thrive well only in a few places like Assam, Darjeeling, some other parts of West Bengal and in Kodaikanal in south India. In the northern plains, most of the orchids except a few do not grow well and usually die during the summer months. Orchids can be successfully grown indoors as well as in the open.

Orchids belong to several genera, such as *Aerides, Coelogyne, Cattleya, Dendrobium, Cymbidium, Arundina, Paphiopedilum, Cypripedium, Calanthe, Phais,, Vanda,* etc., which differ in their growth habit, shape, size and colour of flowers, foliage, etc. The orchid flower is characterised by its three sepals, three petals and the column or gynostemium having the reproductive parts. Of the three petals, two are identical, while the third is highly modified and is the showiest part of the blossom, commonly known as the lip or labellum. The lip may be tubular or broadly expanded with warts or protuberances and in a few cases it may be almost indistinguishable from the other petals.

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(a) Orchids are useful for growing on hanging wood logs, in baskets or in pots. They are ideal cut flowers which last for a long time. However, it is one of the most expenseive cut flowers in export market. Sri Lanka, Thaïland, Singapore and a few other countries are important exporters of orchids.

In the tropics, most of the orchids are usually epiphytic, i.e., aerial plants growing on branches of trees or bushes but not deriving nourishment from them. The orchids are also terrestrial which grow in soil like other plants. A few species are also saprophytic which live on dead, decayed or dried animal or vegetable matter. They are not cultivated as it is difficult to provide the same conditions for their growth as are found in nature in which they thrive well.

Of the numerous species of orchids, only a few can be successfully grown on the plains. The orchids that flower on the plains year after year are limited to the species, *Aerides multiflorum (A. affine), Aerides odoratum, Cymbidium aloifolium, Phaius wallichii* (terrestrial), *Saccolabium guttatum, Dendrobium pierardii, Dendrobium moschatum, Pholidota imbricata* and *Vanda tessellata* var. *unicolor (V. Roxburghii),* which are natives of our country. However, in Assam, Darjeeling, Sikkim, Kodaikanal and a few other places, most of the orchids can be successfully grown without much difficulty.

(b) Numerous Hybrids with very attractive flowers suitable for cut flowers have been developed abroad.

Propagation of orchids is by division of pseudo-bulbs or stems after flowering. A few species like *Aerides saccolabium* and *Renanthera* are grown from cuttings. Orchids can be grown from seeds also but it is not recommended for amateurs because raising plants from seeds is very difficult and it takes years for the plants to flower. However, new hybrids and varieties are developed from seeds by orchid experts. In other countries orchids are multiplied by meristem culture using artificial growth media.

The epiphytic orchids are usually grown on hanging logs or small pieces of wood with roots covered with a thin layer of dried sphagnum moss. Sometimes they are also grown in small hanging-pots which are perforated round the sides for aeration and drainage. They are also grown in baskets. The potting mixture contains five parts of small broken pieces of brick and one part fern roots of Bird's Nest or *Polypodium.* A mixture containing equal parts of small broken pieces of brick, coconut husk, dried moss or peat, small dried pieces of bone and small pieces of charcoal can also be used. For terrestrial orchids, the potting mixture contains equal parts of cowdung manure, leaf-mould, soil, sand and crushed charcoal. The potting of orchids should be done in February. They will bloom in March-April. In the hills, they should be grown in heated glass-houses or rooms, if possible. The plants should be watered frequently and kept cool under humid and moist conditions, particularly during the summer months. They thrive best in green houses, in partial shade or in a fern house where water may be sprayed frequently during the day to provide humidity and avoid direct sunlight.

ROSE

Rosa species and hybrids

Other common name: Gulab

FAMILY: Rosaceae

Modern roses are derived from crosses between the Chinese roses *(Rosa chinensis)* and the European roses *(R. gigantea, R. damascena* and *R.moschata).* The species *R. moschata,* a wild rose climber, popularly known as Musk Rose, is also a native of the Himalayas. Some of the well-known old climbing varieties, Hybrid Musks like Penelope, Prosperity, Pax and Vanity, are derived from *R. moschata.*

As a result of crosses between the Chinese and the European roses, several kinds of roses, such as the Bourbon, Portland, and Noisettee and later a better rose, the Hybrid Perpetual, were produced and became popular in gardens. The foundation of the modern rose was laid in France at the end of the eighteenth century when Guillot gave the first Hybrid Tea rose, La France (1867), by crossing the Hybrid Perpetual with the Chinese Tea rose. The Hybrid Tea roses produce large and well-shaped flowers. Later Pernet-Drucher, another French rose breeder, created the first yellow Pernet rose from a cross between the Hybrid Perpetual and *R. lutea (R. foetida),* the Persian yellow or the Austrian Brier. These Pernet or Pernetian roses when crossed with the Hybrid Teas gave rise to some very lovely colours and hues hitherto unknown, such as yellow, apricot, orange and several bicolours. Unfortunately the modern rose lost its characteristic fragrance and became susceptible to diseases like black spot and die-back due to its association with the Persian yellow parent. However, in some cases, the sweet fragrance was restored by backcrossing to the fragrant Hybrid Teas.

During the middle of the nineteenth century, the Dwarf Polyanthas or Poly Pompon roses were produced by crossing a dwarf seedling obtained from the Chinese species *R. multiflora* with the China rose *(R. chinensis)* which combined the clustering habit of the former species with the perpetual flowering habit of the latter. The Hybrid Polyanthas, later known as Floribundas, were produced in 1924 by the Danish rose breeder, S. Poulsen, by crossing the Dwarf Polyanthas with the Hybrid Teas. The Floribundas possess the clustering habit of the Dwarf Polyantha and the large-sized and superior quality blooms of the Hybrid Tea. With further crossing of the Floribundas with the Hybrid Teas, these two classes are now almost getting indistinguishable and some of the Floribundas like Queen Elizabeth, Sea Pearl, Pink Parfait, Malibu and others resemble the Hybrid Tea very closely. In the

U.S.A., such varieties are also known as Grandifloras.

The rambling species *R. wichuriana,* introduced into Europe from Japan, when crossed with *R. multiflora* and the Hybrid Teas, produced some of the well-known ramblers like Dorothy Perkins, American Pillar, Excelsa and others. The Hybrid Polyantha Climbers, also known as ramblers, such as Paul's Scarlet and Chaplin's Pink, were derived from the species *R. multiflora.* The strong and heavy climbers arose as bud sports from several Hybrid Teas and Floribundas, such as the climbing Crimson Glory, Clg. Virgo, Clg. Show Girl, Clg. Spartan and various others.

The Miniature or Fairy roses have descended from Miss L. Lawrence Rose *(R. lawrenciana* and *R. rouletti),* the two dwarf types of China Rose. They are dwarf and useful for growing in pots, window-boxes and vases and also for edgings.

Types of Roses: There are six different types of roses grown. in gardens, namely, hybrid tea, floribunda, polyantha, climbing and rambling, miniature and shrub roses. In our country, shrub roses are not grown so commonly as in other countries.

With the renaissance in gardening during the early Mughal days, the Persian rose, particularly the Damask rose, was introduced into India. It was brought into our country *via* the port of Bussorah by Babar in the year 1526 or so. Later during the British period, the Edward rose, a hybrid Bourbon rose *(R. bourboniana),* was introduced into India about 1840. The Edward rose is now commonly used as a rootstock for budding roses in our country, particularly in the Punjab, Delhi, Uttar Pradesh, and other areas. The two roses, namely, the Damask and the Edward, were widely grown in gardens around Delhi, Agra, Lucknow and some other towns in north India during the sixteenth and nineteenth centuries and are still cultivated in several places mainly for preparing rose water *gulkand* and *attar* (perfume).

Uses: The rose is commonly used in the garden for mass display in beds, as a climber on walls, arches etc, as a shrub or in pots. It is one of the best cut flowers and it has a great potential for export, especially during winter months (November to March). It is also used in preparation of perfumes, rose water, *gulkand* and rose otto.

Propagation: Although roses can be propagated both by budding and by cutting, the former method is preferred for obtaining better quality and faster-growing plants. In Bengal, roses are also propagated by inarching. Ramblers, polyanthas and miniature roses are successfully multiplied from cuttings. The cuttings can be inserted into soil or sand from December to February or in July-August. The pruned stems at the time of pruning in October can also be used for cuttings to raise new plants.

The best time to bud the rose is from December to February in north India, particularly in Delhi, Punjab and Uttar Pradesh. The commonly used rootstock is the Edward rose, while in some regions like Bengal, northern hills and south India, *R. multiflora* is used for this purpose. Another rootstock *R. indica* var. *odorata* recommended by the Indian Agricultural Research Institute has become popular in recent years. It is resistant to powdery mildew disease and hardy even under adverse soil conditions. The rooted plants of the Edward rose raised from cuttings put in from December to February are transplanted in July or August at sites where the budding is to be attempted.

In the budding procedure, there are three essential steps, namely, the preparation of the rootstock, the selection of the bud wood and the insertion of the bud. The budding is usually done about 5-8 cm above the ground level on a strong stem of the rootstock, about the thickness of an ordinary pencil after cleaning the stem and removing the thorns. The other branches on the rootstock plant are removed, leaving only a single stem for budding. The budding can also be done at the base of the stem, near the junction of the stem and the root. For preparing full standards, the budding is done at a height of 1 m, while the weeping and half standards are budded at 2 m and 45 cm heights, respectively.

Bud wood, about 15-25 cm long, is taken from below the faded flower. About three to four plump but not too elongated buds situated in the middle portion of the bud stick are suitable for budding. The top few buds are usually much elongated and old, while those at the bottom are too young for budding. The bud which is usually 2.5 cm long is taken from the stem with the help of a sharp knife by cutting a little into the bark. Any wood attaching to the bud after pulling out is removed gently. This bud is then inserted in the T-shaped incision (about 2.5 cm long) made on the stem of the rootstock after opening the top with the help of the flat end of the knife. Later alkathene tape, about 45.5 cm long and 6 cm wide is bound around the bud-point, keeping the eye open.

After the bud has been taken, the stem of the rootstock is cut a little above the budded point and the alkathene tape is removed. The budded plants will be ready for planting after about six months of budding.

Planting: The rose-bed should be located in a sunny situation away from trees or hedges and it must receive sunshine for at least the whole forenoon if not the whole day. The beds are usually rectangular but sometimes these may be oval, circular or of irregular shapes, depending upon the garden design. It is always better to plant roses in beds than to grow them individually. If you can have more than one bed in the garden, it is better to have one variety in each bed but in case it is not possible to do so, more than one variety may be grown in a bed, preferably of the same colour, if possible. The Hybrid Teas and Floribundas should be planted in separate beds, as far as possible. Full or half standards of Hybrid Teas and Floribundas when planted along the path look very attractive.

While grouping the varieties in a bed, it is necessary to take into consideration the height of the plants and the colour of the flowers. Tall varieties should be put in the back row, while the dwarf ones in the front row and those intermediate in height in the middle row. The colour combinations must be pleasing and harmonious.

The bed should be well drained as the rose does not thrive in a wet or waterlogged soil. If the soil is heavy and poor in drainage, we may put a layer of coarse gravel and sand at the bottom of the bed. The beds should be dug up to a depth of 75 cm at least a fortnight before planting. Well-rotted cowdung manure may be mixed with the soil in the proportion of one part manure and two parts soil while returning the soil to the bed. The bed should be allowed to settle during rains.

The best time to plant roses in the northern plains of our country is from September to November. They can also be planted till February. However, early planting will always ensure good flowering during December. It is advisable to plant roses in the evening. The bushes are planted about 75 cm apart in a row and the distance between the rows is also the same. The standard or tree roses are planted about 1-1.25 m apart and the distance between the climbers may be about 2-2.5 m. Before planting, bonemeal or superphosphate may be added to the soil at the time of preparation of beds, about 227 gm to each plant.

At the time of planting, a hole of 100 cm diameter and 75 cm deep is dug at the appropriate sites in the bed. While planting, the earthball around the roots of the new plant should be placed in the centre of the pit. The plant should be placed in the pit at the same height above the ground as it was in the nursery. The soil around the base of the stem must be firmed after planting and the bed copiously watered soon after planting. It is useful to apply about half a basket (about 8 to 10 kg) of cowdung manure to each pit at the time of planting.

Pruning: About three to four days before pruning, watering is withheld. In Delhi and adjoining areas, the rose is generally pruned during the second week of October, from the 7th to 14th, and after about 6 to 7 weeks of pruning, the plants start flowering. The time of blooming can be adjusted according to the date of pruning.

The new or so-called "maiden" plants are not pruned and these are generally tipped lightly before planting. Generally, the nurseries cut the tops a little before supplying the plants. The old Hybrid Tea bushes are pruned by removing all old and useless wood and shortening the previous season's thick shoots by half their length, keeping about 5 to 6 eyes on each stem. The cut is made a little above an eye which is facing outside. A harder pruning, retaining only 3 to 4 buds on each stem, is practised to obtain larger exhibition blooms.

The Floribundas are pruned moderately. The new growths pruned to the first good eye below the flowered cluster, while the two-year-old wood may be reduced by a half. The other older shoots can be removed altogether in the case of vigorous plants. The climbing and rambling roses need almost no pruning except removal of the unhealthy, dead and interlaced twigs. The standard and polyantha roses are pruned lightly, while the miniatures are generally not pruned.

Feeding: Soon after pruning, the roots of the plants are exposed by removing about 10-15 cm deep soil from a diameter of about 45 cm around the roots. This can be done with the help of a fork. The roots are kept exposed for about three to four days. Later about half a basket of cowdung manure (8 to 10kg) is added to the soil removed from the roots earlier and then the soil mixture is returned to the roots and firmed before watering the plants copiously. Sometimes immediately after pruning, a 5-cm thick layer of cowdung manure is spread at the top of the soil in the bed.

After about a fortnight, a mixture of ammonium sulphate and sulphate of potash, each about 58 gm per sq. metre or one table-spoonful per bush, is hoed lightly into the soil a little away from the base of the plant and this is followed immediately by watering. It may be convenient to apply some fertilizer mixtures, particularly those recommended for roses, instead of applying the various fertilizers separately. A convenient and useful fertiliser mixture can be prepared by taking ammonium sulphate (2 parts), superphosphate (8 parts) and potassium sulphate (3 parts). About 90 gm of the mixture may be applied to each bush.

Bonomeal, about 60 gm per sq. metre, may be applied every other year for obtaining a good growth. Ammonium sulphate and sulphate of potash can be given to plants again in January-February after the first flush of flowering is over. Often a mixture of four parts of magnesium sulphate and one part of iron sulphate applied at the rate of about 15 gm per sq. metre once a month is beneficial in obtaining brighter-coloured flowers. Foliar feeding can be supplemented, if required. A foliar spray of 2 parts urea, 1 part dihydrogen ammonium phosphate, 1 part potassium nitrate and 1 part potassium phosphate is quite useful. Fifteen grams of this mixture should be added to a gallon of water for spraying. Often it is useful to spray fertilizers along with an insecticide. A spray of one gm of urea and 2 ml Malathion mixed in one litre of water is a simple and effective foliar feed. The foliar spraying should be done once a week. It can be started by the middle of November and continued till the flowers open. The foliar spray should not be given when the plant is in full bloom as it will damage the flowers.

Watering: Heavy watering at comparatively long intervals is more useful than frequent light watering. During winter watering once a week is sufficient, while in summer it may be given more frequently, depending upon the weather and soil. Water-logging is harmful to roses.

Suckers: The suckers or shoots of the rootstock which appear usually at the base of the plant from the ground or along the stem of the standard roses should be removed frequently when these appear. They can be distinguished by the shape and the size of their leaves.

DISEASES AND INSECT PESTS

Diseases : The common diseases observed in roses are die-back and black spot Die-back results in the blackening and drying of shoots from the cut ends, after pruning. A fungicidal paint containing four parts each of copper carbonate and red lead and five parts of linseed oil should be applied at the cut ends after pruning to prevent the die-back disease. Sometimes when a flower is cut much above a leaf node, it causes die-back of the shoots and hence it is always a good practice to cut the blooms just above a node. Spraying Bordeaux mixture, Captan, Blitox or any other copper fungicide is effective in controlling the black spot disease. Powdery mildew, which is common in the hills, appears rarely in the plains and it can be controlled by spraying sulphur or karathane.

Insect pests : Among the insect pests, the important ones are aphids, chafer beetles, red scales, digger wasps, thrips, mites and white ants. The aphids and thrips, which appear during winter—December to March—can be controlled by spraying Malathion, 2 ml in one litre of water. In July-August, the plants may be sprayed with sevin (one gm in one litre of water) against chafer beetles and thrips which appear at that time. From August to October and also in April, a spraying of 0.1 per cent Sumithion is effective in controlling the red scales. Rubbing the affected parts with cotton wool soaked into methylated spirit is also useful, especially when only a few plants are to be treated. It is often useful to add 5 per cent aldrin dust at the rate of 30 gm per sq. metre or about one gram per pit at the time of the preparation of beds or pits for planting to prevent the attack of white ants and chafer grubs. A schedule of pesticide sprays on roses is given below :

Months	*Insects and Diseases*	*Control measures*
At planting (Sept-Oct.)	White ants	3 gm. Aldrin or BHC 5% in each pit or 3 gm. per sq. metre.
Sept-Oct.	Mites	Malathion 0.20% (10 ml in 5 litres of water).
Oct. (at pruning)	Die-back and digger wasp	Apply fungicidal paint at cut ends. For fungicidal paint, mix copper carbonate (4 parts) and red lead (4 parts) with linseed oil (5 parts) and add a little DDT and BHC in equal quantities.
	Red Scale	Sumithion 0.1% (10 ml in 5 litres of water). It is useful, to spray it within 2-3 days of pruning followed by a spray of Captan 0.2% after a day or two.
Dec-March	Aphids	Malathion (20 ml in 10 litres of water) (the insec-

		ticide can be mixed with foliar spray also).
Mar-April	Red Scale	Sumithion 0.1% (10 ml in 10 litres of water).
April-May	Jassids	Malathion or Rogor 0.2% (10 ml in 5 litres of water).
July-Sept.	Chaffer beetle and thrips	Sevin spray (0.1%).
Feb.-April	Powdery mildew	Wettable sulphur, Beulate (0.1%) spray.
Nov.-March	Black spot	Beulate (0.1%) or Captan 0.2%.

VARIETIES

There are numerous varieties of roses grown in gardens. However, a few important varieties of each type of rose which have been found to grow well here are mentioned below:

Hybrid Teas:

I. *Red and dark red*—Charles Mallerin, Avon, Papa Meilland, Oklahoma, Mister Lincoln, Christian Dior, Black Velvet, Crimson Glory, Happiness, Fragrant Cloud, Red Devil, Erotica, Bhim.

II. *Orange*—Hawaii, Super, Star, President Herbert Hoover, Duke of Windsor.

III. *Yellow*—Summer Sunshine, King's Ransom, Spek's Yellow, Golden Splendour, Western Sun, Golden Giant, McGredy's Sunset, Kiss of Fire, Grandmere Jenny, Pusa Sonia, Double Delight.

IV. *Pink*—Picture, Eiffel Tower, Michele Meilland, Confidence, Lady Luck, First Love, Montezuma (coral pink), South Seas, Show Girl, Carina, Shammon, Lucky Lady Bel Angel, First Prize, Century Two, Mrinalini.

V. *White*—Virgo, Mt. Shasta, Tushar, John F. Kennedy, White Christmas, Message, 'Matterhorn, Dr. Homi Bhabha.

VI. *Bicolours*—Suspense (red and yellow), Teenager (pink and white), Perfecta (pink and white), Rina Herholdt (pink and white), Bajazzo (red and silver), Inge Horst-mann (deep pink and cream), Caprice (plum red with ivory), Dr. Valois (vermillion and yellow), Piccadilly (scarlet and gold), Rose Gaujard (pink and white), Granada (deep pink and yellow), Mexicama (red and silver).

VII. *Lavender or mauve*—Blue Moon, Cologne Carnival, Inter-mezzo, Sterling Silver, Prelude, Africa Star, Orchid Masterpiece, Paradise, Neelambari, Lady X.

VIII *Novel Colours*—Careless Love (pink with white streaks) Anvil Sparks (coral red with yellow stripes)

IX. *Fragrant Roses*—Avon (non-fading red), Papa Meilland (velvety dark red), Crimson Glory (deep velvety crimson), Charles Mallerin (deep velvety blackish crimson), Mirandy (rich dark red), Oklahoma (ebony red), Dresden (greenish white), Eiffel Tower (rose madder), Fragrant Cloud (dark coral red), Chrysler Imperial (crimson red), General MacArthur (rose red), Ena Harkness (crimson-scarlet), Etiole de Hollande (bright-red), the Doctor (satiny-pink), Haldley (crimson), Wendy Cussons (rose red), Sugandha (deep pink).

X. *Long-pointed buds*—Arles (orange-salmon shaded red), Christian Dior (scarlet velvety), Chrysler Imperial (crimson red), Confidence (pale satin-pink), Michele Meilland (soft salmon-pink), Eiffel Tower (rose madder), Henry Ford (silvery pink), First Love (pale dawn), First Prize (pink), Lady Luck (rich pink), Grandmere Jenny (apricot-yellow), Papa Meilland (velvety dark red), Helen Traubel (light sparkling pink), Rose Gaujard (cherry red), Super Star (pure orange), Virgo (white), South Seas (deep shell-pink), Granada (deep red with yellow in centre), Montezuma (deep coral), Picture (clear rose pink), Red Devil (red), Carina (pink), Mrinalini (pink), American Heritage (cream with deep pink edges).

Floribunda—Celebration (light salmon red), Circus Parade (yellow), Charleston (yellow, crimson), Carrousel (deep velvety red), Elizabeth of Glamis (deep salmon), Flamenco (salmon colour), Fashion (deep peach colour), Independence (orange apricot), Orangeade (bright orange), Orange Sensation (orange flame), Rumba (cherry yellow), Saratoga (white), Zauberlehrling (vermilion), Daily Sketch (bicolour, pink and silver), Dearest (rosy salmon), Iceberg (pure white), Zambra (pure orange), Spartan (orange red), Zorina (geraldine red), Tiki (soft pink), Delhi Princess (pink); Himangini (buff white), Sarvodaya (orange), Banjaran (red and gold), Shola (orange), Prema (soft pink with deep pink edges, Suchitra (pink), Navneet (cream).

H.T. type Floribundas—Malibu (orange-red), Pink Parfait (light pink), Queen Elizabeth (carmine rose), Sea Pearl (pearly pink), Tiki (light shell-pink), Prema (light pink).

Polyantha—Chattilon Rose (deep pink), Ideal (dark scarlet-red), Madam Gladstone (buff pink), Paul Crampel (deep orange-scarlet), Rudolph Kluis (purplish red), Sheelagh Baird (shell pink),, Vater Tag (vermilion), Swati (pink), Echo (deep pink changing to almost white).

Miniature—Cri-Cri (salmon-shaded coral), Josephine Wheatcroft (yellow), Baby Masquerade (lemon chrome), Coralin (red-orange), Dian (light red), the Fairy (pink), Sweet Fairy (pink), Little Flirt (bright red), Little Buckaroo (bright velvety red), Frost Fire (red), Cinderella (white), Bit o' Sunshine (butter-cup yellow), Rosemarin (silver rose), Cinderella (pole pink), Mini (deep pink), Little Sunset (pink to sunset yellow).

Climbing and rambling—Clg. Show Girl (pink), Clg. Virgo (white), Clg. Peace (pink), Clg. Spartan (orange-red), Clg. Michele Meilland (light pink), Clg. Crimson Glory (dark red), Prosperity (white), Marechal Niel (light yellow or lemon), Golden Showers (yellow), Delhi White Pearl (white), Delhi Pink Pearl (pearl pink), Casino (yellow), Lamarque (pure white), Don Juan (dark red), Mardan Pink (pink), Mardan White (white), Danse du Feu (dark red), Mrs. Pierre S. Dupont (yellow), Paul's Scarlet (scarlet).

Shrub Roses—Cocktail (red with a yellow centre), Joseph's Coat (red and yellow).

Varieties suitable for cut flowers—Happiness (red), Mister Lincoln (red), Mercedes (red), Sonia (light orange), Superstar (orange), Ilona, Queen Elizabeth (pink), Golden Times (yellow), Belinda, Jack Frost, Bridal pink (pink poly) Red Garnet (red poly), Red Success (red), Lora (pink), Calmild, La Minnette, Jougar, Motrea and Corona.

The varieties Sonia, Ilona, Mercedes, Golden Times, Red Success, Lora, Belinda, Jack Frost, Calmild, Corona, Bridal Pink and Red Garnet are some of the popular varieties of roses for cut flowers in export markets in the Netherlands, West Germany and France etc.

(g) WATER PLANTS

THE INDIAN LOTUS

Nelumbo nucifera

Other common name : Kamal

FAMILY : Nymphaeaceae *ORIGIN :* Asia

The lotus *(Nelumbo nucifera)* is a native of India and it is the sacred flower described in classical Sanskrit literature and the *Vedas.* Kalidasa has mentioned the lotus in *Shakuntala* and other plays.

The plant is suitable for growing in large water pools. The leaf is large and round with a cylindrical stalk attached to its centre. The flowers are large, single or double, very fragrant and white, pink, rose or amaranth-red in colour. The seed heads of the lotus resemble the rose of a watering-can. The seeds are eaten as a vegetable in our country.

WATER LILY

Nymphaea spp.

Other common name : Kumudini

FAMILY : Nymphaeaceae *ORIGIN :* India, Europe, Africa, Australia, Tropical America

Four horticulturally important species of *Nymphaea,* namely,*N. Lotus, N. pubescens, N. rubra* and *N. stellata* are natives of India. The species *N. Lotus,* popularly known as the Egyptian or Indian lotus, grows wild in the tropics of the Old World. The flowers are large, double and white in colour and are pink or red at the base of petals. In some varieties, the flowers are pure white. The flowers are not fragrant as in the case of the lotus.

N. pubescens is a native of India, Java and the Philippines. It produces small, white flowers. Its tubers and seeds are eaten in our country. The flowers of *N. rubra* are large, double and deep red in colour. It is a native of Bengal and is considered to be a beautiful species. The flowers open in the night during the summer months. This species has been crossed with other species to produce attractive hybrids. In the species *N. stellata,* the flowers are medium to large in size and pale blue in colour. White-flowered varieties and a variety with reddish-purple flowers are also available. It is a native of South-East Asia.

A few other important species, such as *N. coerulea* (pale blue) and *N. capensis* (deep blue), natives of Africa, and *N. alba* (white) a native of Europe, are also commonly grown in water pools. The flowers of *N. coerulea* and *N.-capensis* are fragrant. Several hybrids produced as a result of crossing between different species and varieties are also popular in gardens. With their numerous varieties and hybrids having exquisite blooms of various colours (white, yellow, red, pink, blue, copper, etc.) and attractive foliage, the water lilies are considered the jewels of the water garden. Many of these *Nymphaeas* are day bloomers, while some bloom at night.

CULTIVATION OF WATER PLANTS

Planting: Both *Nelumbo nucifera* and Nymphaea (water-lily) are propagated by division of rhizomes or tubers. The common method of planting them in a filled pool is first to put them in a basket, pot, tub or any other container filled with a mixture of soil and compost or well-rotted cowdung manure and then place the basket in the pool in such a way that the crown of the plant is just above the surface of water. The basket may be kept on bricks in the pool for about 7 to 10 days and it may be lowered gradually when new growth appears on the plant. In the case of an empty or newly-constructed pool, the planting can be done directly into the soil base of the pool. A mixture of soil and compost or well-rotted cowdung manure is spread at the bottom of the pond, at least 15-25 cm deep. After planting, a little water is allowed to run into the pool so that the crown is just above its surface. After 7 to 10 days, some more water is added and this is continued till the pool is completely filled. In about 6 to 8 weeks, the pond will be almost full.

Pools : Concrete pools are commonly used for growing aquatic plants. The shape and size of the pool vary with the size of the garden and individual preferences. The shape may be formal or informal. In an informal shape the edges are usually made inconspicuous by putting plants around the pool to impart it a natural appearance. The concrete pool must be waterproof. The shape of the pool may be round, oval, square or rectangular or it may be kidney-shaped.

A water-garden is rewarding if you can have a place for it in your garden. Permanent cement pools, which are expensive, difficult to construct and require a large space, are not always necessary. Even in a small garden, one can create a miniature water-garden by using ready-made or prefabricated pools.

Large, old, wooden barrels or casks cut in halves, wooden tubs or discarded bath-tubs or galvinised water-tanks are ideal for this purpose. Barrels in which oil or soap was stored should be avoided, as these will be difficult to clean and hence are not suitable for growing plants. These barrels may be sunk either singly or in groups of two or three at a place. The rim of the barrel should be kept about 2.5-5 cm above ground level to prevent surface water coming in. The rim may be covered with small stones or pebbles or low-growing plants to disguise the edge and produce an informal appearance.

In the U.S.A. and other countries, ready-made or prefabricated pools of plastic shells, polythene, glass-fibre or aluminium in various shapes and dimensions are available. One can also construct a polythene pool if there are no sharp stones or pebbles below the ground level. One can dig a pool of any shape and size, preferably an irregular shape and spread a layer of sand over it to smoothen the surface before lining it with polythene. A double lining with thick black polythene sheets of about 500 gauge will be quite durable. About 15 cm of this polythene around the edge should be covered with soil and disguised by using stones or dwarf plants.

Those who live in flats can even use small rectangular galvanised tanks or glass-bowls, about 25-30 cm deep, for a water-garden and place them on a sunny window-sill. A sunny location is essential for the water-garden. There is no necessity to change the water regularly in these tubs or ready-made pools. The water can be changed by siphoning or by bailing but only once or twice a year. Sometimes it may be necessary to add more water which might evaporate during extreme summer.

Aquatic Plants : In these ready-made small pools or tub-gardens, one can grow water lilies *(Nymphaea)*, particularly the dwarf types having a compact growth like the varieties Laydekeri and Pygmaea Helvola, which require shallow water, about 15-30 cm or 45 cm deep only. Larger varieties of aquatic plants like *Victoria regia* or similar others which thrive in deep water and spread widely are not suitable for growing in small pools.

Only one or two water lilies should be planted in each tub or barrel, about one plant per 30 sq. cm. They are usually grown by rhizomes. The planting can be done at any time of the year. To plant them, the rhizomes are inserted in the soil and then a little water is filled just sufficient to cover the crown and later water is added slowly at intervals as the plant grows bigger and finally water is filled up to 2.5 cm or so below the brim. The complete filling of the pool with water may even take a month or more.

Besides the water lily, one or two oxygenators or aerating plants should also be grown as they complement the fishes which are generally put in the pool. These oxygenators or submerged plants help to maintain the natural biological balance which is very important for the mutual existence of plant life and fish. They release exygen which is taken up by the fishes and consume carbon dioxide exhaled by the latter. The two common aerating plants are the water tape grass *(Vallisneria spiralis)* and *Ceratophyllum verticillatum.* If space permits, one may have an ornamental floating aquatic plant like the Arrow Head *(Sagittaria),* the Water Hyacinth *(Eichornia crassipes)* or *Limmanthemum indicum.*

Along the border of the pool on one side, some tall rushes like the bulrush *(Typha angustifolia)* or the Umbrella Palm *(Cyperus alternifolius)* when planted serve as a natural backdrop. Zephyranthes, Day Lily *(Hemerocallis)* or ornamental grasses may be planted in drifts along the edge to produce a natural effect. Due precaution should be taken to avoid overcrowding of the plants in the pool.

Fishes : A few fishes, preferably the Gold Fish, are also generally put into the pool; about 2.5 cm-long fish (excluding tail) is adequate for about one gallon of water or 15 sq. cm of water surface. The fishes check the growth of mosquitoes in the pool as they eat egg and the larvae. A few scavengers like snails are also recommended but these are not useful in a small pool.

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